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EBENEZER IN HIS SHOP. Frontispiece.

JOHN GAY; OR, WORK FOR BOYS.

By JACOB ABBOTT.

IN FOUR VOLUMES.

ILLUSTRATED BY H. W. HERRICK.

WORK FOR WINTER.



NEW YORK :
PUBLISHED BY HURD AND HOUGHTON,
401 BROADWAY, COR. OF WALKER STREET.

1864.

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 - II. WORK FOR SPRING.
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-

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HURD AND HOUGHTON,
in the Clerk's Office of the District Court of the United States for
the Southern District of New York.

RIVERSIDE, CAMBRIDGE:
STEREOTYPED AND PRINTED BY
H. O. HOUGHTON AND COMPANY.

TO THE PARENT.

THE object of this series is to assist boys to occupy themselves, and to aid the parent in finding amusement and employment for them, by explaining to them the nature of such mechanical operations as they can safely and properly prosecute with the assistance of the instructions here given.

Many of the readers of the books will perhaps actually undertake some of the operations here described, and so reduce the instructions to practice. Others will not do this ; but the author hopes that these also may derive pleasure and advantage from the perusal of the books, through the knowledge which they may acquire from them of the various mechanical and philosophical principles which their years and their state

of mental development enable them to comprehend and appreciate, and which the incidents narrated in the several volumes, and the conversations accompanying them, are intended to elucidate and explain.

CONTENTS.

CHAP.	PAGE
I. BENNY	7
II. OFFICES AND SALARIES	15
III. EBENEZER IN HIS SHOP	27
IV. BORERS AND BORING	34
V. MASTER AND APPRENTICE	44
VI. TACKS AND BRADS •	55
VII. STRINGENT RULES	66
VIII. PARALLELEPIPEDONS	78
IX. TEACHING BENNY	90
X. MAKING A BRAD-AWL	103
XI. TEMPERING STEEL	116
XII. THE TRAYS	128
XIII. LAW QUESTION	141
XIV. DOWELLING	150
XV. PROGRESS	160
XVI. ABOUT MARTINS	167
XVII. GETTING THE MARTIN-POLE	173
XVIII. AN EXCURSION	181
XIX. ROSE'S	187

ENGRAVINGS.



	PAGE
EBENEZER IN HIS SHOP.....	<i>Frontispiece.</i>
GRINDING THE BRAD-AWL.....	114
MATCH-MAKING.....	144

JOHN GAY'S WORK IN WINTER.

CHAPTER I.

BENNY.

ONE day John Gay's little brother Benny was playing about the floor with his kitten, while his mother was at work near a window, sewing. There was a table in the room not far from the window, with a great deal of work upon it, and there were various shreds and pieces of white cloth lying around the table and under it upon the floor.

The way that Benny was playing with his kitten was this. The kitten was under the secretary. Benny had a feather tied to the end of a long thread. He would throw the feather down upon the carpet in front of the place where the kitten was, and then drawing it along by the thread, would entice the kitten to dart out at it and attempt to seize it.

"Mother," said Benny, "do you suppose that the kitten thinks this feather is a mouse?"

"Very likely," said his mother.

"Some sort of white mouse, I suppose," said Benny.

However this may have been, the kitten darted out repeatedly and very eagerly at the feather, trying to seize it in her paws, until at length she happened to clap her paw upon it just as Benny pulled away the string, and so the string came off.

"There now, Mungo!" exclaimed Benny, "you have done some mischief! You have pulled off the mouse from the string!"

Mungo was the name of Benny's kitten. John had given her that name because she was so black. She was as black as jet, and her fur was very smooth and glossy.

Benny seized the kitten somewhat roughly, and the kitten, in struggling to get away from him, scratched him. He cried out a little at the pain, and let the kitten drop, when she immediately ran away.

"Ah, Mungo," said Benny, "now you have done a great deal more mischief than you did before!"

He however bore the scratch pretty well. He took up the feather, and began to play with it by blowing it up into the air, and then, when it fell down upon the carpet, picking it up again. He amused himself in this way for some time, until at length the feather happened to come near the fireplace, and the draft of air passing into the chimney drew it in, and it suddenly disappeared.

"There now!" exclaimed Benny; "I have lost my feather!"

"Never mind," said his mother. "There are plenty of other things to pick up. I wish you would pick up all these little shreds and pieces on the floor for me."

But Benny, instead of doing this, sauntered along toward the sofa and sat down.

"Can't you do that for me?" asked his mother.

"Why, mother," said Benny, "I'm pretty tired."

However, he got up from the sofa and began to pick up the shreds from the floor, but he did it in a very listless and languid manner; and, after taking up three or four, he sat down upon the carpet and exclaimed, with a sigh,—

"Oh, dear me!"

"What is the matter, Benny?" asked his mother.

"I'm so tired!" replied the boy, with a dismal sigh.

"I wish you would explain one mystery to me," said his mother.

"Mystery?" repeated Benny.

"Yes," rejoined his mother: "something hard to understand. There is a mystery about children that I can't possibly understand, and I wish very much that you would explain it to me. The mystery is why they never can find any pleasure in doing anything that is useful. The moment that anything that they are doing or that they like to do can be turned to any useful account, that spoils all the pleasure of it,—at least it seems so to me."

"But, mother," said Benny, in an expositulating tone, "I really am very tired."

"Yes," said his mother, "that is just it. As long as you had nothing but a feather to pick up, which did no good to anybody, you were not tired. You ran about and seemed to have twice as much strength as you needed. But as soon as your feather

was gone, and I wished you to pick up shreds and pieces instead, which might have done some little good, then all at once you became so tired."

While his mother had been speaking to him, Benny had left the sofa and gone to her chair, and now he stood by her knee, leaning upon her; and she began, as she finished what she was saying, to tickle him under his arms, by which action he knew that she was not much displeased with him after all. He laughed and jumped back out of the way, and then said, —

"Well, mother, I don't believe that anybody that is so little as I is *meant* to do much good. We are only meant to have a good time."

His mother smiled.

"Do you suppose that my Mungo is meant to catch real mice now while she is so little?" asked Benny.

"No," said his mother, "I don't think she is. We ought not to expect it of her. She is only fit to run after feathers."

"Would it have helped you very much if I had picked up the pieces on the floor?" asked Benny.

"Oh, no," said his mother; "very little. Dorinda will come and brush them all up by and by. But there is one thing that you can do that will really help me. Go up to my chamber and bring me down my thimble, which you will find on the window there."

"Oh, mother, it is so cold up-stairs!" said Benny.

"Is it very cold?" asked his mother.

"Yes, mother, it is very cold indeed," said Benny. "There is frost on all the windows."

"Very well, then, you need not go," rejoined his mother. "I thought perhaps you were brave enough not to mind a little cold. But I admit you are right in thinking that children as young as you were not intended to do much good. I should be glad to compromise with you and release you from doing any good on condition of your not doing any mischief."

"But, mother," said Benny, "I *don't* do any mischief."

"Sometimes," said his mother. "When I gave you a pair of scissors the other day, you cut the hair all off the top of pussy's

head, under pretence that you were a barber and that she was a customer."

"I thought she would look better," said Benny, casting down his eyes and appearing somewhat confused.

"She did *not* look better," said his mother; "she looked a great deal worse: and so you did mischief."

Benny looked down, but did not reply.

"How would you like to make a compromise with me?" asked his mother.

"A compromise?" repeated Benny.

"Yes," said his mother. "A compromise is a sort of agreement to divide what is in dispute. The compromise which I propose is this, that I am not to expect you to do any good, and that you, on your part, agree never to do any mischief."

"Well," replied Benny, "I will agree to that."

"And will you keep to your agreement faithfully?" asked his mother.

"Yes," said Benny, "I truly will."

"Remember, then, that the agreement is made, and if you forget and do any mischief, then I am entitled to call upon you to do something useful enough to make up fully for the damage."

"Well, I will," said Benny. "But here is Mungo wanting to play. I wish I had another feather."

"I know where I think you can get one," said his mother.

"Where?" asked Benny, eagerly.

"In the bed up-stairs in my chamber," replied his mother. "Go up into the chamber and go to the bed-side, and turn down the clothes and feel along the feather-bed, until at length you feel the sharp end of the stem of a feather sticking out. Take hold of it and pull it out. If the first one that you find is not a good one, feel for another."

"Yes," said Benny. "I'll go."

"It is pretty cold," said his mother, with a lurking smile upon her face.

"Oh, never mind," said Benny,—and off he ran.

CHAPTER II.

OFFICES AND SALARIES.

BENNY's brother John was three years older than Benny. He was *ten*, while Benny was only seven. He went to school, and he was away at school on the day that Benny had his adventure with the feather and made his compromise with his mother.

Dorinda came in not long after Benny went up-stairs to find a feather, and she proceeded to put the room in nice order. She was a girl who did the sewing and mending for the family, and she had a sewing-machine which she was very skilful in working. Benny liked very much to stand by and see her work the machine, but he did not like it at all that she would never let him put his foot on the treadle below and make the wheel go round. She said it would get the sewing-machine out of order.

There was, however, an old sewing-machine somewhere in the garret, that had been condemned as not of a good kind, it having been one of the cheap machines which were made when sewing-machines first came into use. This machine had been given up, and the boys had used it for a plaything until all the upper works had become broken to pieces and scattered about, while the table and the treadle, together with the axis and the two wheels upon it, still remained in tolerable working order. Benny used to turn this very often, and it did not get out of order he said, and he did not see why Dorinda would not let him turn *her* machine sometimes.

When Benny came down-stairs he found Dorinda putting the room in order. The room was quite a large and very pleasant one. It was used as the common room of the family, and it had a great deal of furniture in it of various kinds. There were two windows on one side, looking toward the south, and one at a corner on the east side, where the sun shone in early in the morning. Near this morning window, as they called it, there was a folding-

desk, that is, a desk that could be shut up like a portable desk, only it stood on legs, and was of the right height to be used by the boys. This desk was furnished with paper, pens, pencils, drawing-cards, books of arithmetic, reading-books, slates, and other such things. Nothing however was allowed to be put in this desk that did not relate to study of some kind or other.

Besides this desk there was also one other article of furniture that the boys were interested in, and that was a secretary. This secretary consisted of shelves above and drawers below. The shelves were appropriated exclusively to the boys' books, except the lower one, which formed a museum where John and Benny kept their curiosities. There were four drawers below, which were filled with things belonging to Benny's mother. You must remember about these drawers, for we shall have something to do with them by and by.

A little after twelve o'clock that day, as Benny was sitting in a low chair near the desk, holding Mungo in his lap, and looking at the pictures in a picture-book, John came in from school.

"Benny," said John, "I have got my sled mended."

"Who mended it for you?" asked Benny.

"Ebenezer," said John. "I have been to his shop."

Ebenezer was a farmer's boy who lived pretty near. He was a very large boy, being more than eighteen years of age. He was however very good-natured, and he had a shop in a sort of half basement and half cellar at the end of a shed, where he used to work in winter days sometimes, mending his father's tools, or making things to be used on his father's farm.

"Ebenezer is a good fellow," said Benny.

"Yes," said John; "but I wish I had some tools of my own, and then I could mend my sleds and things myself. I'm going to ask my mother to buy me some. We can buy a very good chest of tools for boys for eight dollars."

"How big a chest?" asked Benny.

"As big as that," said John, showing with his hands by holding them apart at the proper distance. "I saw one in a shop-window. Thirty tools in it."

"That is a great many," said Benny.

"Yes," replied John. "I could do almost anything with thirty tools."

At dinner-time that day John asked his mother about the tools. He had nothing to do in the house, he said, in stormy days in winter, and the tools would be just the thing for him. They would only cost eight dollars.

"If you could only contrive some way to earn the money," said his mother.

"Well, mother, how *can* I earn the money?" replied John. "I am willing to work if you can only find me something to do."

"You would have to saw eight cords of wood," said his mother, "to earn eight dollars. Do you think you could do that?"

John had no very distinct idea how much eight cords of wood might be, but he had a strong impression that the sawing of that quantity would be quite a formidable undertaking.

"I think sawing wood is too hard for me, mother," said he.

"I think it is, too," said his mother. "There is a great deal of hard work in sawing eight cords of wood,— but there is

only eight dollars' worth, after all; and in any other kind of work where you earn money by mere strength, you would have to use the same amount of strength as would be required to saw that quantity of wood. And I suppose you might as well use your strength in that way as any other; that is, if strength is what you are going to depend upon for your earning. But there is another way of earning money than by mere strength, that is much easier."

"What other way?" asked John.

"By skill," said his mother; "that is, provided you have skill. But, unfortunately, boys of your age, while they have not much strength, have usually less skill, and so it is very hard for them to earn money in any way."

"I wish there was some way or other that I could earn the money," said John, "for I want a chest of tools very much indeed."

"I would buy them for you myself," said his mother, "if I were sure that you could do anything with them."

"Oh, I am sure I could work with them," said John. "I have seen Ebenezer work

with his tools so much that I know all about it."

"I wish you would ask Ebenezer," said his mother, "the next time you go to his shop, whether he thinks you could do anything with a chest of tools. If he says decidedly that he thinks you can, then I will buy you one. If he says you cannot, then I shall not think it best to buy you one; but you may buy one yourself, if you can find any way to earn the money."

"How *can* I earn the money?" asked John.

"Do you wish to do it by strength or by skill?" asked his mother.

"I would rather earn it by skill, if I could," said John.

"There is one thing," said his mother, "that perhaps you might do. You might help me take care of Benny. You do help me take care of him, as it is, a great deal. You take him out to play with you, and let him slide downhill, and when he feels cold you come in with him sometimes, though you have to give up your own sliding in order to do it. Then, when he gets hurt you know how to take care

of him and comfort him. All that is *skill*, and I think you can earn money more easily by that than you can by your strength in any way."

John was very much pleased to hear these commendations, but he did not reply.

"But *sometimes* he *troubles* me a good deal," said Benny, speaking in a low and timid tone.

What Benny said was very true. Like almost all other boys, though often kind and attentive to his little brother, John was sometimes rough and impatient with him; and not unfrequently disputes and difficulties arose which it occasioned their mother a good deal of trouble to arrange and settle. Mrs. Gay did not, however, take any notice of what Benny said, or allude to these troubles at all. She understood the principle, so important in the management of children, that they are much more easily led to make efforts to correct their faults and make improvement by having what they do that is *right* noticed and encouraged, than by having what is wrong pointed out to them, and being censured for it. So she took no

notice of what Benny said, but went on as follows :—

“ I will tell you what I am willing to do for you. I will appoint you to an office, and give you a salary so long as you perform the duties of it skilfully and safely. I appoint you Benny’s special friend. The duties of your office are to take care of Benny so far as you can, so as to relieve me as much as possible. You are to teach him all you can of whatever it will be useful for him to know, and help to amuse him and make him happy. You are to take care, when he is out at play with you, that he does not get hurt, and does not tear or soil his clothes, nor go into any dangerous places ; and, in a word, act as his special friend on all occasions. It will require considerable skill and patience to do this well, and perhaps you will not succeed. But if you do succeed, and so long as everything goes on well, I will pay you twenty-five cents a week as your salary.”

“ But, mother, suppose Benny won’t mind what I say,” said John.

“ Ah, but I don’t give you any particu-

lar authority over him," said his mother. "I appoint you his *friend*, not his master or governor. And there is the difficulty. It will be hard for you to get along smoothly and pleasantly with him, without having any absolute authority. If you have skill enough you can manage it, for you understand this is an office in which you are going to earn your salary by skill, and not by strength. If you find you have the skill, you will earn your money very easily; but if you have not the skill and cannot acquire it, then you won't be able to earn it at all, and will have to give up the office. Would you like to try it?"

"Yes, mother," said John, "I should like to try it very much. But how long will it take me to earn money enough to buy my tool-chest?"

"Ah, it will take a great while," said his mother. "It will take thirty-two weeks if the tool-chest costs eight dollars. But you must remember, that if Ebenezer says he thinks you can do anything with the tools, I will buy the chest for you myself, and then you can have your salary for other things. But if he thinks it is doubt-

ful, then you must buy it with your own money. Only you would not have to wait thirty-two weeks, for if I find you are getting along well in the duties of your office, then as soon as you have earned one dollar I will lend you the other seven, and you can pay me back as fast as your salary comes in."

John said he would go and ask Ebenezer that very afternoon.

"And I am sure he will say that I can use the tools," said he.

"Did you ever try to do any work in Ebenezer's shop?" asked his mother.

"No," said John. "I have not worked exactly, myself. I have only seen Ebenezer work. He is very strict in not letting any boys touch his tools."

"I wish *I* could have a salary, too," said Benny.

"Very well," said his mother. "You shall. You shall be *my* special friend and do all you can to help and take care of me, just as John is to help and take care of you, and I will give you five cents a week for *your* salary."

"In real money?" asked Benny, eagerly.

"Yes, in real money," said his mother. "I will pay you every Saturday night. That is, in case you are skilful and faithful, and earn the money. You must do all you can to help me. When I am tired or sick, you must be quiet and not disturb me. When there is anything you can do to help me, you must be ready and willing to do it, and try to save me all the trouble you can in every way."

Benny said he would do so, and began at once to caper about the room with joy at the idea that he, too, was going to have an office and a salary.

CHAPTER III.

EBENEZER IN HIS SHOP.

THE shop in which Ebenezer worked was in the end of a shed, or rather *under* the end of a shed, for it was at a place where the ground fell off in such a manner as to give an opportunity to make a sort of basement-room half underground. The back side of the room was a wall of stone, and the floor was formed of large flat stones, laid in the form of a pavement. At one side was a monstrous fireplace, where, on the days when Ebenezer was at work, there was always a great blazing fire, formed of all sorts of irregular and misshapen masses of wood, mingled with abundance of chips and shavings from the work-bench.

Ebenezer chose this place for his shop because it was *so safe*, on account of the stone walls and stone floor, in respect to fire. There was, however, one disadvan-

tage attending it, and that was that the dampness of it made the tools rusty. But though the surfaces of Ebenezer's tools looked black, the edges of them he kept so sharp and keen that it was a real pleasure to use them.

On the day when John went into the shop to ask Ebenezer's opinion about his buying some tools, he found him employed in mending the hay-rakes, by putting in new teeth to replace those that had been broken during the last summer in the work of haying.

"Ebenezer," said John, "what are you mending your rakes for, at this time of the year? Do you expect to have any hay to make while there are two feet of snow on the ground?"

Ebenezer made a slight inarticulate sound in answer to this question, and went on with his work as if he did not consider it worthy of any farther notice.

"Ebenezer," continued John, "I have come to ask you a question for my mother. I want her to buy me a chest of tools, and she says she will, if *you* think it is a good plan. And I knew you would think it was a good plan."

“No,” said Ebenezer, “I don’t think any such thing.”

“Why not?” asked John, much surprised.

“Because boys can’t do anything with carpenter’s tools,” said Ebenezer.

“Why, yes,” said John, “I could make a great many things with them. Think how many things you can do with your tools.”

“What you need most,” said Ebenezer, “in making things, is skill, not tools.”

“Skill!” repeated John, much surprised. “We could not do anything if we had ever so much skill, unless we had tools to work with.”

“That is possible,” said Ebenezer; “but still if you have skill you can do a great many things with very few tools, but without the skill you cannot do anything if you have all the tools in the world. To give a chest of tools to a boy who does not know how to use them is like giving a pair of spectacles and a spy-glass to a blind man.”

“But how am I ever to learn how to use tools,” asked John, “if I don’t have any to

try? You never will let me use any of yours."

"Buy one at a time," said Ebenezer, "and learn to use that, and then gradually buy others as you come to the want of them. In a chest of tools there would not be one that you would now know how to use. I don't believe you know how to bore a hole with a gimlet."

"Oh, yes, I do," said John. "Let me have one of your gimlets and I'll let you see."

"Very well," said Ebenezer, "I'll do it." So saying, he took down from his tool-rack a small gimlet, and gave it to John, together with a small and quite narrow piece of wood. The piece of wood was a long square stick in fact, not more than half an inch wide. Ebenezer, in giving John the gimlet, made a little prick with the point of it in the wood, very near the end, and directed him to bore a hole there.

John began to bore, but pretty soon, Ebenezer, as he expected, heard a little crack, while John suddenly stopped and exclaimed, —

" Ah, it has split."

" Yes," said Ebenezer; " that's what I expected."

" Well, that is 'cause it is such a thin piece of wood."

So saying, John threw his split stick away, and came up to the end of Ebenezer's bench, and began examining the point of the gimlet, to see if there could be anything wrong there.

There was nothing wrong. The gimlet was very sharp and in excellent order in all respects.

" It must be because it was such a thin and slender piece of wood," said he. " If you would give me a good big board, and let me bore a hole in the middle of it, where it is strong, I could do it well enough."

" Yes," said Ebenezer, " no doubt; but when you are at work making anything for any useful purpose, the hole that you will wish to bore won't always come in the middle of a great big board. In fact it will be much more likely to come very near the edge of the board, or in some slender and narrow piece which will split easily. So you can't pretend to know how to use a

gimlet until you can bore a hole with it anywhere."

"I wish you would show me how to do it," said John.

"I can't leave my work to show you," said Ebenezer; "but I will tell you something about it while I go on mending my rakes. You see my time is not my own, and I have no right to give it away to boys."

"Whose is it, if it is not yours?" asked John.

"My father's," said Ebenezer. "All my time now is his, and I am bound to use it for his benefit, faithfully, till I am twenty-one, to pay him for all the care he took of me when I was a baby and a little boy."

"Is that the law?" asked John.

"Yes," said Ebenezer. "That's the law for everybody, — for you as well as for me. Your mother has taken care of you and given you all you wanted to eat and wear, and a house to live in ever since you were born, and the law is that as soon as you are able to do anything for her, or to help her in any way, you are bound to do it, and to give her all your time and services until you are twenty-one years old."

No doubt that Ebenezer was correct in this statement. And this principle is not only according to law, but it is according to natural justice and right. Parents do not always require their children to do what the law thus makes their duty,—but it is out of pure kindness and generosity toward them that they release them. And even if children faithfully fulfil their obligation, as Ebenezer did, they then do not half repay the care, anxiety, and trouble which they caused their parents in their earlier years.

Ebenezer did not leave his work to show John how to bore, but went on making teeth for his rake by means of a chisel, while he gave John a sort of lecture on the subject of borers and boring. The substance of what John learned from this lecture will be given in the next chapter.*

* See Frontispiece.

CHAPTER IV.

BORERS AND BORING.

I SHALL give the substance of what Ebenezer taught John about borers and boring while they were talking together at the bench in Ebenezer's shop, without pretending to relate all the conversation, as that would take up too much space in the book.

"There are two kinds of tools which are used for boring small holes in wood, namely, gimlets and brad-awls. The difference between them is this, that gimlets bore by cutting away the wood and bringing up the little chips and borings that they make, out of the hole, as fast as the gimlet goes in. The brad-awl on the other hand does not bring any wood out of the hole, but crowds it all out to one side or the other, into the surrounding wood.

"If you look at a gimlet attentively, you

will see how ingeniously it is contrived to cut the wood away as it goes in, and bring the little chips up and out of the hole.

“ At the tip end of the gimlet is a screw which runs down to a point. The object of this screw is to pierce the wood in advance of the hole, and by the threads of the screw to draw the gimlet in after it. It is hard to understand precisely how a screw, by merely being turned round, can draw the gimlet in, but so it is, and you will find that when you bore a hole with a gimlet, if it is a good one, and if the screw is in good order, you only have to turn it round and round, without having to press it down at all, excepting a little at first to get it started. After it is once started, it will draw itself in, and cut its way deeper and deeper, by your merely turning it round and round.

“ Above the little screw you will see that in every gimlet there is a groove which extends a long way up the stem. This groove is sometimes straight, and sometimes it is twisted, so as to pass round and round the shank in a spiral direction. This groove has a sharp edge on each side, which

is to cut away the wood on the sides of the hole, and so enlarge the hole as the gimlet goes in; and the groove itself forms a channel for the little chips which are cut out to come up by, and get out of the hole. When the groove is made in a spiral form, the design is that, being so made, the chips may be brought out more easily and rapidly, so that there will be less danger of the hole getting choked up by them.

“ A gimlet, however, must be very nicely made, and be very sharp in all its cutting edges, to cut away and bring out all the wood from the hole it makes. Most gimlets crowd out into the adjoining wood a great many of the particles that they remove in making the hole. It is this crowding of the particles out on each side that makes the wood split when it is a very thin or narrow piece, or when the wood is of a very hard kind, so that it will not yield and allow itself to be compressed.”

Ebenezer explained all this to John, as he stood by him at the bench, and showed him that the reason why he split his small piece of wood in boring it, was that the gimlet in going in did not *cut out* and

bring away all the wood that was in the course of the hole, but crowded some of it aside, and that this was the force that split the stick open. He told him too, that the way to prevent this when you have a hole to bore in a very narrow piece of wood, or at a place very near the edge of it, was to pull the gimlet out after boring in a very little way, so as to bring out all the chips and cuttings, instead of leaving a part of them in the hole, and to repeat this action after every two or three turns, and thus make room for the gimlet to advance without wedging the wood open and so splitting it.

Ebenezer explained to John that it was only necessary to take this precaution in cases where the wood was very narrow, or the hole was to be near an edge or a corner; for in case of boring into the middle of a solid piece of wood, especially if it was soft wood, like pine, all that the gimlet could possibly do, in the way of crowding the particles of wood aside, would not be enough to split it.

Ebenezer explained to John also, that there was another thing to be learned in

the use of the gimlet, and that was how to bore straight. He told him that the way to learn this was to stop while he was boring, now and then, and hold the wood up and observe the position of the gimlet in two directions, that is, looking at it from front to back and then from side to side, to see whether it leaned either way; and then, when it came through on the other side, to see whether the hole was exactly as far from the edge as it was where it went in.

“And now,” said Ebenezer, when he had given these instructions, “I advise you, instead of buying a whole chest of tools that you don’t know anything about, to begin with a single gimlet that you can buy for three cents, and practise with it on blocks of wood until you can bore straight wherever you begin, and can also go through the smallest blocks and strips without splitting.”

From gimlets Ebenezer went to brad-awls, which are also tools for boring small holes in wood. They are made on a different principle from the gimlet, which is contrived to cut away and take out the chips,

for the brad-awl does not cut away or take out anything, but only forces its way into the wood, and crowds the material of it out of the way by main force.

“A brad-awl is called by that name because it is an awl employed for boring holes for *brads*, which are small slender nails used for light finishing work, and for nailing the sides of small boxes together.

“I suppose that almost all the readers of this book must have seen, and perhaps used, a brad-awl. The body of it is simply a round wire, ground at the end in the shape of a sharp wedge. The edge of this wedge cuts across the fibres of the wood, and the sides of it force them away, so that by working the awl a little this way and that, and forcing it down into the wood, it makes the hole by crowding the wood off out of the way, without cutting any chips at all to come out. Of course a brad-awl will only do for small holes. Some brad-awls are very small indeed, —not larger than a coarse needle, and they increase in size from that up to the smaller kinds of gimlets. Of course gimlets may be made to bore much larger

holes than brad-awls, since they cut away and bring out a large portion of the wood from the hole, while the brad-awl only jams it aside.

“There is a sort of projection called a shoulder, where the brad-awl goes into the handle, to prevent its being forced in too far, when bearing hard upon it in boring, and the part that goes into the handle, which is of course out of sight, is made flat, or square, to prevent its turning round in its socket when you are boring with it.

“There is one thing which it is necessary to understand about the brad-awl, which is still rather difficult to explain in a book, and that is, if the piece of wood is narrow, or if you are boring near the edge of it, so that there is danger of splitting it, then the tool must be set in with the cutting edge *across* the grain, and not lengthwise of it. If the edge is lengthwise of the grain, then the sides of the wedge, by crowding the fibres apart, tend to split the wood open. But if it is across the grain, then it does not tend to crowd the fibres apart, but only to crowd them endwise into

each other, and this does not tend to split the wood at all. Thus, whether you can bore a hole in a narrow piece of wood with a brad-awl without splitting, depends altogether upon the manner of holding the tool when you force it down into the wood. If you try boring with a brad-awl through narrow or small pieces of wood, you will understand better what I mean, and you will see that it is really so."

Ebenezer told John that after he had learned to bore straight and without splitting both with a gimlet and a brad-awl, he would not yet have learned more than half about those tools. The most difficult part remained, he said, and that was to know how to keep them in order, — that is, to use them in such a manner as not to injure them, and also to sharpen them when they get dull, and to tighten the handles again when they get loose. He said, however, he would not teach him anything about those thing at that time, but would wait till after he had learned to bore holes well.

"Then you think I had better not have a chest of tools," said John.

"Certainly, I do," said Ebenezer. "All that a boy does with a chest of tools when he buys them, before he has learned how to use them, is to knock them about and make them dull and out of order, and get himself vexed and out of patience because he can't work with them. He forgets, or rather he does not know, that it is *skill* and not tools that is the great thing, and it is of no use to get the tools any faster than he learns how to use them.

"Besides, even if you had the tools," added Ebenezer, "you could not do anything with most of them without a bench of some kind, and a vice to hold your work in. Then you could not work in the winter with them without a fire; and as you could not have a bench and make shavings in any of the rooms in the house, you would have to have a fire on purpose in some backroom, and this would be very dangerous."

I think that this advice of Ebenezer's was very judicious. Boys often get a box of tools, either by buying them or receiving them as a present, and when they first open them and look them over, they are quite

delighted with them. But they soon find three great and insuperable difficulties in the way of accomplishing anything with them. They don't know how to sharpen them and keep them in order; they don't know how to use them without splitting and breaking their work, or getting into other troubles; and they have no accommodations in the way of bench and room. It is a great deal better therefore, in most cases, for a boy to begin with few and simple tools, and learn to use and take care of them first, and then buy more as he comes to feel the want of them. This is especially the case inasmuch as a great deal of very ingenious and useful work may be done with very few and very simple tools, as will appear more fully by and by.

CHAPTER V.

MASTER AND APPRENTICE.

WHEN John reported to his mother that Ebenezer's opinion was that he had better not have a chest of tools at once, but only buy a few at a time, beginning with the simple ones and then procuring more as he found he needed them, and could learn the use of them, she fully approved of the plan thus recommended, and she told John that she had no objection to lending him ten cents in anticipation of his first week's salary, so that he might buy one or two gimlets at once, and begin to learn to bore.

Benny, when he heard this, wished that his mother would lend him some money too, so that he might buy a little gimlet, and try what he could do. Mrs. Gay said that she would do this. She would lend him five cents, and then he could have a gimlet of his own, as well as John.

"Only," said his mother, "five cents will

be a whole week's salary; and if I pay you in advance in this way, you must be honest and faithful in being my special friend all the week, so as to earn the salary."

Benny said he certainly would do so, and Mrs. Gay gave both the boys their money.

Ebenezer had told John that a drawer would be the best thing for him to use as a shop while he was learning the use of the simple tools; and so John asked his mother if she could not let him have one of the drawers in the secretary.

"The lowest drawer will be best for us," said he, "for that is next to the floor, and so Benny and I can sit upon the floor close by it while we are at work."

Mrs. Gay assented to this, and said that she would take the things out of the drawer and make it ready for them while John was gone to the store to buy his gimlet.

Benny then immediately said that he wanted to go too. He wanted to choose his own gimlet, he said. John was at first unwilling to let him go. There was so much snow on the ground that it was very slippery walking in the road; and Ben-

ny would not be able to keep up with him, he thought. So he concluded that it was best for Benny not to go.

He knew, however, that, if he said so openly, Benny would be very much disappointed and would cry; and so he determined that he would contrive to slip away slyly, without Benny's knowing it.

"He will be a little disappointed," thought he to himself, "when he finds that I am gone, but when he sees the pretty little gimlet that I shall bring him back, he will forget all about it."

But then he would need Benny's money to buy the gimlet with, and the question was how to get it away from him.

"Benny," said John, "you had better give me your money and let me keep it safe with mine till we are ready to buy our gimlets."

"No," said Benny, drawing back and putting his hand behind him; "no; I am going to keep my money myself."

John looked a little perplexed for a moment, but then he reflected that perhaps ten cents would be enough to buy his gimlets and Benny's too.

“And now, Benny,” said he, “you stay here and see about the drawer, while I go out and see if I can find any little blocks and pieces of wood to put in it, for us to bore.”

Benny said he would stay, and John went out. It was not altogether a falsehood that he told when he said he would go and see if he could find some blocks, for when he was at Ebenezer’s shop, Ebenezer had given him a number of small blocks and short, narrow strips of wood, suitable to practise boring upon, and he had them all now in his pocket; and when he said that he was going to see if he could find any such pieces he considered it the truth, for he was going to feel in his pockets when he got out, and so find the blocks which he had put there!

A deceiving sort of statement like this, though meant to mislead a person and give them a wrong idea, is not exactly a falsehood, and it is not as bad as a falsehood. It is called sometimes a subterfuge. A subterfuge means something like a hiding-place, as when you hide yourself or your intentions behind some false pretence. What John really intended to do was to

slip out and make his preparations for going into town to the store, by himself, and he hid away this design under pretence of going out to look for the blocks. And thus it was a subterfuge.

Benny seemed satisfied with this arrangement. In a few minutes, after John had made all his preparations, he came back with his hands full of little blocks which he laid down upon the floor.

"There, Benny," said he, "look at all these blocks. You can play with them on the floor until the drawer is ready, and then you can put them in and arrange them in order."

So, while Benny was busy with the blocks, John slipped out of the room, put on his coat and cap, which he had placed all ready upon the table, and then, taking his sled at the door, he set off to go into town.

He had not proceeded many steps before all at once the thought came into his mind of his office and his salary. It seemed to him that it was by no means doing his best to amuse and take care of Benny to go off by stealth in that way, and leave him. He

knew of course that as soon as Benny should find out that he was gone to the store without him, he would feel greatly disappointed and would perhaps begin to cry ; and in the end perhaps put his mother to a great deal of trouble to console and comfort him.

So he determined to go back at once and offer to take Benny with him if he wished to go. It was very honorable in him thus to remember his agreement with his mother, and to return of his own accord and fulfil it faithfully.

He came back just in time, for Benny, suspecting as it seems that something was wrong, had left his blocks upon the floor, and had run out into the back hall where John kept his cap and coat, and when he found that they were gone, he at once concluded that John had been playing him a trick, and he was just beginning to cry aloud with disappointment and vexation, when John opened the door and came in. Benny suddenly hushed his crying.

John, without appearing to take any notice of Benny's distress, said at once, —

“ Benny, I am going now to buy the tools,

and if you wish to go with me you can, but it is very cold."

Benny said that he did not care for the cold, and he wished to go very much indeed.

"You don't know how cold it is," said John. "And it is growing colder every moment. It will be down to zero to-night."

"What is zero?" asked Benny.

"I don't know exactly," replied John; "only it is a mark on the thermometer where it is dreadfully cold."

"I don't care," said Benny; and he immediately began to take down his coat and cap and mittens, and to put them on, standing by the stove in the back hall.

This back hall was a kind of entry. There was a settee in it and one or two chairs, and hooks to hang coats and caps upon, some low for John and Benny. There was also a sort of a bureau, an old-fashioned article of furniture, formed to open like a chest above, and with one drawer below.

When Benny had put on his coat and cap, he and John went off together. In about three quarters of an hour they returned with their purchases, which con-

sisted of a small gimlet for Benny, and a much larger one and a brad-awl for John. The brad-awl was of a size intermediate between the two gimlets. Thus with the three tools three holes of different sizes, increasing in regular gradation, might be bored.

As soon as the boys had put away their coats and caps and warmed themselves a little, they proceeded at once to the sitting-room and opened the drawer which their mother had by this time emptied for them, and commenced their work. They first put all the blocks and pieces of wood into one end of the drawer, reserving the other end for their tools; and then each selecting a block or piece of wood, they began the work of boring, and occupied themselves with it busily for more than an hour, — their mother sitting all the time at her work near the morning-window. They encountered several difficulties, however.

In the first place, John had a great deal of trouble at first in trying to make Benny bore right. He said that he was master and Benny was his apprentice, and that Benny must follow all his directions. But

Benny seemed to pay but very little heed to his directions. The very first hole that he bored he split the wood; but instead of being sorry for this, he seemed delighted, and immediately began to bore another hole, in hopes to see it split again. In vain John assured him that this was wrong, and told him that the very thing to be done was to bore *without* splitting, — and explained to him how he must do it. But Benny would not bore in that way, but went on splitting the sticks as fast as he could. Indeed, it seemed to him that it was a double excellence in his gimlet that it would split wood as well as bore it.

At last John lost all his patience, and he called to his mother in a fretful and complaining tone, —

“Mother, I wish you would speak to Benny and make him bore right. He does not bore right at all, and I don’t believe he tries to bore right. He does not mind in the least what Ebenezer said, and he never will learn.”

“Come here a moment, John,” said his mother.

So John went to his mother, and, stand-

ing by her side, began to complain again of Benny's indocility.

"It seems to me," said his mother, "that Benny is too young really to learn to use carpenter's tools. I think I would not try to teach him. All that he can do is to make believe learn. Let him do just as he pleases, provided he is amused. *You* can really learn, but let him only make believe."

On a little reflection, John was convinced that this was, after all, much the best plan, and so he went back, and had no more difficulty. Benny bored his holes in all directions, and split as much wood as he could in his boring; and the more odd the course was that the gimlet took, and the more unexpected the place where the point of it came through, and also the more the wood was split and cracked by the operation, the better he seemed pleased.

Another difficulty arose about brushing up the litter that the boys found they made upon the carpet when the work was done. The gimlets in boring cut out from the holes they made a quantity of fine particles of wood, like sawdust, which fell upon the carpet. The boys observed this, and they

promised that as soon as they had finished their work they would sweep it all up again. They tried in fact to do so ; but they found that they could not manage it very well. Their mother finally concluded that it would not be best for them to do their actual work in that room, though she said they might retain the drawer to keep their tools in if they chose, and any finished work which they might do. But for work in hand she assigned the drawer in the chest-bureau in the back hall ; for the floor of the hall was covered with a painted carpet, from which chips and borings, whether large or small, could be very easily swept up.

John liked this arrangement very well, for the hall was always kept warm by means of the stove, — and then, moreover, there was no danger there of his and Benny's operations being interrupted by company.

CHAPTER VI.

TACKS AND BRADS.

EBENEZER told John that if he would practise boring with the gimlet and the brad-awl until he could bore straight, and without splitting, he would show him how to make boxes.

"And the first thing that you must try to make," said Ebenezer, "is a nail-box. A good workman, as far as possible, makes his own implements and tools, and the first thing to begin with is a nail-box.

"And in order to make a box," continued Ebenezer, "the first thing you have to do is to get some idea of form."

"Of form?" repeated John.

"Yes," said Ebenezer; "so as to know when an edge is straight, and when one edge is square with another."

"I know that already," said John.

"Oh, no," said Ebenezer, "not accurately." And in order to put this point to the

test he asked him to look about the shop and find two strips or pieces of wood that had straight edges. The first piece which John brought was very far from being straight; and John perceived the crookedness of it the moment that Ebenezer pointed it out to him. At last, however, he found two narrow strips like rulers, that he said were perfectly straight, he was sure. Then Ebenezer directed him to put the two edges together and hold them up to the light to see if there was any crack to be seen between them.

John did so, and he found that though the edges touched at different places here and there, yet in other places they were a little way apart, — only a *very little* way, it is true, but still enough to let the light shine through, and thus to show that the edges could not have been absolutely straight; since, if they had been so, they would have been in actual contact through their whole length.

“ Oh, I did not mean so very straight as that,” said John.

“ That’s it, exactly,” said Ebenezer.
“ Boys like you not only don’t know

whether a thing is straight or not, but they do not even know what straightness is. The first thing you have got to do in learning carpenter's work is to get some of your ideas corrected."

"Why, Ebenezer," said John, "things may be straight, and yet not so very *perfectly* straight that you cannot see the least glimmer of a crack between them."

"We may call them straight," said Ebenezer, "but they are not really so. They are only *nearly* straight. There is no such thing as one thing being straight and another one straighter. The straight one is only straight, and the other is nearly straight. Still we commonly call things straight when we mean only that they are nearly straight. There is no harm in this. You may use the language just as you please, provided you have right ideas about the thing."

At first John supposed that he could not possibly make his pieces of wood straight and square for the sides of his box, without a saw and a plane; but Ebenezer taught him how to do it with a sharp-pointed knife and sheet of sand-paper. John had a knife already, and he afterward

bought a sheet of sand-paper for two cents. He had a hammer, too, — a small carpet-hammer which his mother lent him. Having provided himself with all these things, Ebenezer told him that he wanted nothing more to enable him to go to work but a stock of lumber. For that he advised him to go to the cabinet-maker's and buy some pieces of thin pine wood, what he called "quarter-inch stuff," — planed smooth on both sides.

"The wood of cigar-boxes is very good," added Ebenezer, "if you have got any cigar-boxes in your house."

"No'," said John. "There's nobody in our house that smokes cigars."

"You can buy them sometimes at the grocer's for a few cents apiece," said Ebenezer; "but thin pine wood will be best for you to begin with. And if you will bring your sled here some day, with a basket, you may have all the blocks and small pieces you can find among the shavings under my bench. They may be of some use to you, though you can't work them much with a knife and sand-paper, because they are too thick."

Ebenezer also gave John particular instructions how to proceed in making his nail-box with these tools and materials. What these instructions were will appear by the account I shall give of the manner in which John proceeded with his work in following them.

When Saturday came, at the end of the first week of the office and salary, Mrs. Gay paid John what she had promised, deducting what she had advanced to him at the beginning to buy gimlets and brad-awls. The balance which he received was fifteen cents. He immediately went into the town and bought some sand-paper, and also a small paper of what are called three-quarter-inch brads. There were plenty of carpet-nails in the house, and his mother gave him a supply of these, so that he had two kinds of nails to put into his nail-box to begin with.

There is a great difference in the form of carpet-nails and brads, arising from the different purposes that they are to be applied to. A carpet-nail has a broad flat head, and is sharp-pointed at the end. The *brad*, on the other hand, has a blunt

point, and scarcely any head at all, — only a small projection on one side.

The reason why the carpet-nail is made with a sharp point, is because it must make its own way into the floor, without having any hole bored for it. In putting down a carpet it would be very troublesome to have to bore a hole in the floor for every separate nail put in, and this is not at all necessary, as the boards of the floor are so thick and strong that there is no danger of splitting them, however forcibly the nails are driven in.

In the case of a brad-awl, on the other hand, which is used for fastening the sides of small boxes together, and for nailing on mouldings and other light finishings, it will not answer always to drive them in without boring, or to have the points of them sharp and wedge-shaped, as that would greatly increase the danger of splitting the wood. So the point is made blunt in order that the sides may not *spread* as they recede from it, and thus give the nail a wedge-like form to split the wood. The head, too, is made very small. The head of the carpet-nail is made large and flat, so that it

may extend over several of the threads of the carpet, when it is in its place, and thus get a better hold to keep the carpet down.

But this is not necessary in the case of nailing wood with a brad, for the brad holds the pieces of wood together not so much by its head as it does by the roughness of the iron along the sides. The brads are made rough along the sides, and not smooth and polished like a pin, for this very purpose — that in order by their roughness they may hold better.

There is a special reason, too, for having the head of the brad small — and that is in order that it may not show much along the side of the box, or on the face of the moulding. Indeed, sometimes the workman wishes to have the heads concealed entirely, and in this case he drives the brads in so far, by means of a little punch, that the head sinks entirely into the wood. This of course leaves a small hole in the wood. The painter, however, when he comes to paint the work, fills up these little holes with putty, and then paints over them; and thus the nails entirely disappear from the surface, while still they hold on *strong* within.

All these things Ebenezer explained fully to John as he stood by his side at his bench; and every boy who can get a few brads and carpet-tacks, and who will try them a little in different pieces of wood, will easily see the truth of what has been here explained. These may seem to be little things, but it is only by close attention to little things like these, and cultivating a habit of close observation, and perceiving exactly in what ways different mechanical effects of this kind are produced, that a boy can lay the foundation for being a good workman.

And if a boy begins by studying carefully the form of the more simple tools, and observing the exact mode in which they operate, he will carry this habit with him in respect to the more complicated ones, and so will act intelligently in all his working with them. This is the only way, in fact, to become a good mechanic.

When John had brought home the things that he had purchased, he sat down at the desk, near the morning window in the sitting-room, and made out an account of his expenditures thus : —

RECEIPTS.

Salary for one week.....\$00.25

EXPENDITURES.

Gimlet	\$00.05	
Brad-awl	00.05	
Sand-paper	00.02	
Brads	00.04	
		<hr/> 00.16
Cash on hand		<hr/> 00.09

With the nine cents which John had thus in hand he went to a cabinet-maker's with his sled and a basket, and asked him to let him have as many pieces of thin pine wood — "quarter-inch stuff," such as is used for thin partitions in desks and for the bottoms of small drawers — as he could afford for that money ; — that being all the money he had.

As John was willing to take small pieces, such as the cabinet-maker had left, after cutting out what he wanted for his work, Mr. Bevel, for that was his name, was willing to give him quite a large quantity of wood, much more than John expected for so little money. John put all these pieces on his sled. He put the long pieces on the bottom, and then put the small and short

ones in the basket, and placed the basket on the top. Then he lashed down the whole securely with a long cord, remaining while he did so by the fire in the cabinet-maker's shop, where it was warm. Then he and Benny hauled the load of lumber home.

They then proceeded to Ebenezer's shop to procure the blocks and other pieces which he had promised them, from under the bench. They both crawled under the bench, and began fumbling about among the shavings; and seizing everything that felt solid there, they threw it out upon the floor. They afterward looked over all these pieces and selected from them such as they thought would answer their purpose, and loading these upon the sled, putting some in the basket and some under it, they hauled them home.

The largest of all these pieces of wood the boys stacked in a neat pile in a corner of the shed, which they concluded to call their lumber-yard. The rest, that is all the small, smooth, and neat-looking pieces, they brought into the house and put them in the drawers which their mother had assigned

them. The sand-paper and the tools they put in one end of the drawer in the back hall, and some of the wood—enough to begin upon in their work—in the other end. The prettiest and best of the blocks, such as Benny thought would be good to build houses with by piling them up on the floor, they put in the secretary-drawer in the sitting-room.

“Because, you see,” said John, “there is no objection to your building houses with the blocks on the sitting-room carpet, for that does not make any chips or borings; and sometimes you will want to do that while I am making things in the hall.”

“No,” said Benny, “I want to make things too.”

“Very well,” said John. “Then you can stay and make things with me. But at any rate we will keep all the smooth and pretty blocks in the sitting-room.”

CHAPTER VII.

STRINGENT RULES.

It was late on Saturday afternoon when the boys completed the work of procuring and laying in their stock and their tools, as related in the last chapter; and several days elapsed after this, before John had an opportunity to commence his work. Ebenezer advised him, if he really wished to learn to do anything with tools, to consider it *work* and not play; and not to undertake any operations until he had ample time for them, and then to proceed step by step, in the most deliberate and cautious manner. He must never act in a hurry, he said, in order to finish something at a particular time,—or attempt to work with a tool that was dull or out of order,—or to use a poor or unsuitable piece of wood because he had no proper piece at hand. Such management as that, Ebenezer said, only led to disappointment, worrying, vexation, and failure.

So John resolved not to begin his work until the next Wednesday afternoon, when there was a half holiday. Benny played with the blocks frequently during the interval, and once or twice he attempted to bore a little with his gimlet; but he soon found that there was not much amusement in working unless John was working too, and so he contented himself with building houses by piling up the blocks upon one another, and arranging them in different ways in the drawers.

On Wednesday morning at breakfast, when John was talking about beginning his work that afternoon, his mother told him that she was very glad that he was going to learn to work in wood, and she should be willing to help him by every means in her power. But there were two conditions that she must make before she could allow him and Benny to do such work in the house, or rather there were two rather stringent rules that she was going to make.

Benny wanted to know what sort of rules stringent rules were.

“Why, strict rules,” said his mother,—

rules that she was going to be rigid in enforcing.

Benny said he did not know what rigid meant any more than stringent.

"Rigid means stiff," replied his mother. "A thing that is not stiff is called flexible or yielding. A stem of a young tree which should be stiff enough to make a cane of, would be said to be *rigid*, while a slender switch is *flexible*,—that is, it will easily bend. Now I am going to be firm and unyielding in requiring you to comply with these two rules. And I will tell you what they are.

"In the first place, you are never to work either upon the floor, or upon a table or any other article of furniture, without a board under your work, for a protector."

"I don't know where we can get any boards big enough," said John.

"I will help you about getting some boards," said his mother; "but after you are provided with them, it must be your business to see that you always use them."

"The next rule," continued Mrs. Gay, "is, that whenever you leave off working you must put all your tools and materials

away, and brush up all the chips, dust, and borings that you have made, so completely that nobody could discover, by the closest inspection, that you had been at work."

"That will be pretty hard," said John.

"Yes," said his mother, "it will be very hard indeed. It will be hard for you to remember always to use your boards, and it will be very difficult indeed for you to clear away your litter so perfectly. But I shall be strict and rigid in enforcing the rules. And now for the penalty."

"Is there to be a penalty?" asked John.

"Yes," said his mother. "A rule is nothing without a penalty. It is no law, only a recommendation. I expect to have some difficulty in establishing these rules, for of course you will violate them, and then I shall have to insist on the penalty; and that will be very unpleasant both to you and to me."

"It will be unpleasant for us," said John, "if it is much of a punishment; but I should not think it would be unpleasant for you."

"Yes, indeed," said Mrs. Gay, "it will be very unpleasant for me. I shall have a

very strong desire to let you off from the penalty, but I shall know that if I do so I shall break down my rule."

"But what is the penalty to be?" asked John.

"Ah!" said his mother, "that is a question that we must decide upon. We might either have it a part of your salary to be stopped, or that you were not to do any more about the drawers for so many days."

After some consultation on this point it was finally decided that the penalty for breaking either of the rules should be a fine to be paid out of the salary. The fine was to be two cents for each offence on the part of John, and one cent for Benny.

"And you must remember now," said Mrs. Gay, "that you must submit to your punishment good-naturedly, and give up the money without offering any objections, or making any complaints, when you break the rules."

"Yes, mother, we will," said John. "But I don't think that I shall lose any money, for I am determined not to break the rules at all."

“ You *will* break them, you may depend,” said his mother. “ Indeed, I am so certain that you will not remember to keep them until you have suffered the penalty two or three times, that the sooner you begin the breaking them the better I shall be pleased.”

I think the view of the subject which Mrs. Gay thus took was a correct one. A law is never really established in its full force until it has been broken and the breakers of it punished, so as to make people feel that it is *law*, and not merely advice or recommendation. Parents often make rules, expecting, or at least hoping, that the mere making and announcing of them will be sufficient. But this is a great mistake. The celebrated emperor Napoleon the First used to say that he never considered a city which he had taken as fully in his power, until there had been at least one insurrection in it against his authority, which his soldiers had put down. And so a mother who makes a rule with a penalty ought not to consider her work in respect to it completed, until at least one breach of it has occurred and been properly

punished. Then and not till then will her children understand that the rule in question is *law*.

At noon on the day of this conversation at breakfast, when the boys were ready to begin their work, they put on their coats and caps, and went first down cellar, and then to the store-room, and finally to a sort of lumber-room which opened out from the corner of the shed, to see if they could not find some clean and smooth box, which they might knock to pieces, to obtain short boards for floor and furniture protectors. They found two or three boxes, either of which would have answered very well. From these they finally chose one which was made originally for a shoe-box, —to pack boots and shoes in to be sent from the manufactory to the shoe-store. The box was long and narrow, and had square ends, —and it was smooth both within and without. The boys knocked this box to pieces, taking great care not to split the boards. Then they knocked all the nails out. Thus they had two side-pieces, two end-pieces, and the bottom.

“Now,” said John, “the bottom is not

good for much, for it is cracked, but there are two good sides and two good ends, — all smooth and nice. I will have one of the sides and one of the ends, and you shall have the others.”

“They are nice smooth boards,” said Benny, “and very light, — only I wish we could get the nail-holes out.”

“I can saw them off,” said John; “and I will. If I could only find something for a straight edge to mark by.”

“What do you mean by that?” asked Benny.

“Why, a kind of a ruler,” said John. “The carpenters always call anything they rule by, a straight edge.”

“What do you want to mark it for?” asked Benny.

“So as to go straight and square across the board,” said John. “If I saw it slanting or crooked, then our boards will not be square.”

Benny thought that John could saw it straight enough, without marking. He could guess, he said; but John replied that in carpenters’ work there must be no guessing.

"We must always measure and mark," said he.

" 'Measure and mark,
Or you'll work in the dark.' "

That's Ebenezer's proverb."

So John measured off the same distance from each end of each of the side-boards, by means of a small stick, and marked the places with the point of a nail. Then taking one of the pieces of the bottom for a straight edge, — for the bottom had come apart in the middle, but the outer edge of each part was pretty straight, — he marked the lines which he was to follow in the sawing.

He then took one of the boards to the saw-horse, which was standing in a sunny place near the great open doors of the shed, and proceeded to saw off the ends of the board, where the nail-holes were. While he was doing this with one of the boards, Benny brought him the others, and in a short time the sawing of all the four ends of the side-boards was done. The end-boards, which were square, did not need sawing, for the nails had been driven into the edges of these, and thus did not disfigure them much.

"And if we only had a little putty to fill them up," said John ; "that would hide them entirely. I can get putty enough to fill all these holes for two cents, and I will get some with my next money."

The boys took their boards, each one his own, and carried them into the house. They were light and easy to carry, for they were made of what is called half-inch stuff, that is of wood only half an inch thick.

Each boy had a long board and a square board, and they proposed to use the long boards for work on the floor, and the square ones for the table. They afterward found another use for the long ones, which proved to be a great convenience, and that was for seats. They used to pull the drawer of the chest-bureau in the back hall entirely out upon the floor, and then place their long boards across the two ends of it. This made two very good seats, one for Benny at one end of the drawer, and one for John at the other end, with room on the seat, at one side, to put tools or work upon.

Then when the boys had done their work, and were ready to put their things

away, they used to turn these boards lengthwise of the drawer, and so lay them in it; for though they were long enough to pass across the drawer from side to side, and rest on the edges, yet when they were turned the other way they would lie in it very easily, with plenty of room to spare, all around.

The square boards they employed to lay upon the table, when they wished to use the table, in order to protect the surface of it from being scratched or injured in any way, by their work or by their tools. And in order to make the protection more complete, by preventing the board itself from rubbing too hard upon the polish, their mother fastened some pieces of cloth upon the four corners of each piece, on the under side. She fastened these pieces on by means of a little glue which she dissolved in a mug, placed carefully before the fire.

"And now," said Mrs. Gay, when all these preparations were complete, "if you work upon the floor or upon any of my tables without these protectors, or if, when you go away after you have finished your work any day, I can find in the hall or in

the sitting-room any signs of your having been there at work, then you will have to submit to a penalty. I advise you to imagine that you are two mice that have been nibbling, and that unless you take away and hide every single nibbling that you have made, the cat will find you out and come and catch you."

CHAPTER VIII.

PARALLELEPIPEDONS.

"Now," said John, when he and Benny first sat down to their work, "I have got to see whether I can make a parallelepipedon."

"A what?" said Benny.

"A parallelepipedon," replied John, "a rectangular parallelepipedon."

This extremely scientific term Ebenezer had found in one of his books of carpentry. A parallelepipedon is a body which has its opposite sides exactly parallel, — that is, which has all its sides exactly of the same breadth in every part, without widening or narrowing in any direction. And when, besides this, all the corners and edges are exactly *square*, then it is called a square-edged parallelepipedon, or, more scientifically, a rectangular parallelepipedon.

It is no matter what the shape of a block of wood, for example, may be in other respects. If the sides are parallel, and all the

edges and corners square, it is a rectangular parallelepipedon.

Thus a long board, if the ends are sawed off square and true, and if it is of the same breadth and thickness throughout, is a rectangular parallelepipedon. So is a small square block, or one shaped like a brick.

The dice which are used in playing backgammon are rectangular parallelepipedons; and the sides of boxes, provided the boxes are of the same width at top and bottom.

All such things as these have *six* surfaces, namely, the two ends, the two sides, and the top and bottom. These six surfaces are in pairs, and the two which form each pair are exactly alike, — that is, when the thing is really a rectangular parallelepipedon. The top and bottom make one pair, the two sides another, and the two ends another.

If you take any block of wood, square at the sides and at the ends, and examine it, you will understand all this very plainly.

“Now,” said John, “I have got to find a board for the bottom of my nail-box, and then I have got to make two parallelepipedons for the sides, and then two more for the ends.”

This was true, for you will observe that, while the box itself, if it is straight and square, considered as one solid mass, is a parallelepipedon, each of the six pieces of wood which form it are parallelepipeds too; for each one of these, considered also by itself, is a solid body, not very thick, it is true, but still having some solid content, and each is bounded by three pairs of surfaces, — namely, a top and bottom, two sides, and two ends. And thus the first thing that John had to do, after choosing a piece of wood of the right size for the bottom of his box, was to make a pair of parallelepipedons, exactly of the same size with each other, for the two sides of it.

A great part of the work which carpenters have to do consists in getting out pieces of wood of exactly the same length, breadth, and thickness throughout, in other words, making parallelepipedons. And that is the reason why I have taken so much pains here to explain what the nature and properties of a parallelepipedon are. For the more correct and exact a boy's ideas are of such a geometrical form as this, the more likely he will be to succeed in the work which he undertakes.

Now the usual method which carpenters and cabinet-makers adopt in forming their parallelepipeds, is by means of a square, a saw, a gauge, and a plane. But John had none of these tools, nor had he any bench or other facilities for working with them if he had had them, nor the necessary skill to use them, if he had the facilities. So Ebenezer had explained to him another mode of shaping his pieces of wood, and in accordance with the instructions which Ebenezer had given him, he proceeded in the manner I am now to describe.

Just as he was ready to begin, he saw that Benny had seated himself upon the floor, with his long protecting board before him, and a piece of wood upon it, and was beginning to bore some holes.

"What are you going to make, John?" said Benny.

"A nail-box," said John? "to keep brads and tacks in."

"If that is what it is for," said Benny, "you ought to call it a brad-and-tack box."

"True," said John, "but that is of no consequence. I am going to have some parti-

tions in it, and perhaps I shall keep small nails in one of the compartments."

John's plan was, to have a shallow box — the sides to be only about an inch high — because he did not wish to have compartments too deep for convenience in reaching the nails.

He selected a small piece of wood from among those which he had procured at the cabinet-maker's, for the bottom of the box ; for as the precise size of the box was not material, he wisely determined to save himself some work by taking a piece for the bottom already made. The piece which he chose was about six inches long and four wide. Then he took another piece of wood, large enough to make the sides. He marked out the precise length of the bottom of the box upon this wood. He concluded to have his box an inch deep, less the thickness of the bottom, and so he proceeded to mark on the wood with a ruler and a pencil two strips an inch wide at both ends. Then with the sharp point of his knife he cut a line along the pencil-marks, first very lightly, and then going over it again and again, he cut deeper and deeper each

time, until he had cut nearly half through the wood. For the wood being only a quarter of an inch or a little more in thickness, it was only necessary to cut into it about an eighth of an inch to get half through.

He then turned the board over, and after marking it carefully across the ends, so as to find the exact place on the other side, he cut again on that side; and, after making two or three strokes with his knife, he found that he could break the strip off very easily. He cut the second strip in the same way.

The strips which he had cut were of the right width, but they were too long, and the next thing was to cut them to the proper length. John could mark the length very easily from the length of the bottom of the box. But it was necessary not only to have the length right, but also to have the ends cut off square. To do this Ebenezer had told him, that as he had no carpenter's square, he must make a square by means of a sheet of paper.

"If you fold a pretty large piece of paper," said he — "first in half, and then again in quarter, and take pains to bring the two edges formed by the first fold ex-

actly together, you will make a very accurate square corner, — or *right angle*, as the carpenters call it."

John made his square corner in this way, and laying it down upon his strips, he marked the cross lines by it in the proper places, and then cut them through, first half on one side, and then the other half on the other side, as he had done with the long lines.

It was harder to cut across the grain, of course, then lengthwise with it; but John succeeded in doing it, and thus the two sides of the box were cut out "in the rough," as the carpenters term it.

I say in the rough, for though John had marked out the dimensions of the pieces as accurately as he could, still when they were cut out they were not perfectly smooth and true, for it is impossible in such cases to make the cutting on one side correspond precisely with that on the other. And now for finishing them the sand-paper was to come into play.

For this purpose John put his protecting board on the table, and then laid the sand-paper down upon the board, with the rough

side up. He then took the two pieces which he had cut out, and holding them together side by side, he began rubbing the lower edges of them upon the paper, taking great care to hold them perfectly upright, and to carry them along to and fro in a perfectly level position, without *rocking* them in the least, either from side to side or from front to back. In this way he soon wore down the lower edges of the pieces, so as to make them very smooth and true.

He then did the same with the other sides, until he had made them smooth too. Then he had two strips with the edges finished, but it was not yet certain that they were exactly of the same width throughout their length, as it is plain they ought to be. It is true he had measured them, as correctly as he could, and marked them carefully before he began to cut. But there will always be some inaccuracy in such measuring, and then the knife in cutting will deviate more or less from the true line.

You would think that he would now measure again to see if they were just as wide at one end as at the other ; but there

is a simpler way of doing it, and that is by turning one of the pieces end for end, and applying them to each other again in that reversed position.

If now in such a case there should be any difference in the two ends, the broad end of each will in this second position of the pieces come opposite to the narrow end of the other, and the difference, if there is any, however slight it may be, will be immediately apparent, and may at once be worn away by rubbing them again upon the sand-paper.

By following this process John succeeded in a short time in making the sides of his pieces even and true, and the pieces themselves of the same breadth at each end and throughout their whole length. He then finished the *ends* of the pieces in much the same way.

"There!" said John, surveying his work with great apparent satisfaction; "finished."

"What is finished?" asked Benny, "your nail-box?"

"No," said John; "only the two parallel-pipedons for the two sides. See!"

So saying, he handed the two pieces of

wood which he had shaped to Benny to examine. They were indeed nothing but two plain pieces of wood, but they were so smooth and square and true, and they were so exactly alike when placed together either way, that it was quite a pleasure to look at them.

“And now,” said John, “we are going to put our work away.”

Benny was at first unwilling to do this, being still interested in his boring, and he asked John why he did not go on and finish his nail-box. But John had been recommended by Ebenezer not to work too long at a time.

“As a general rule,” said Ebenezer, “you had better only undertake and finish one operation on your work at one time. Don’t think at all, while you are making a thing, of the time when you will get it done, for that will only make you impatient to see it finished; then you will hurry your work and make mistakes and do it badly; and so you will get vexed and worried, and all the pleasure will be spoiled. The best way is, when you begin to work at any time, to undertake for that day only one

single operation, and take time to do that well ; and when you have done it, lay by your work for that day and go and amuse yourself with something else. Then you will not get tired and worried, and your work in the end will be much better done."

In accordance with this counsel John set himself for his task that day to make the two side-pieces only for his nail-box, and having now finished them, he decided to put his work away.

"And we will brush up every particle of the borings and dust," said he, "so that they cannot possibly find out that the mice have been here."

So he went into the kitchen and brought the dust-pan and a little broom. He set Benny at work to do the first sweeping, while he put his work and the boards into the drawer. Then he himself gave the table and the carpet a second sweeping ; and finally, after emptying the dust-pan, he came back and gave them a third, and then he and Benny examined the carpet and the table in every part to see if there was the least trace of their having been at work there, left in view.

When they were fully satisfied that all was right, they put on their coats and caps and went out to slide.

That evening at supper the boys asked their mother whether she found any traces of their work in the back hall.

"I have not looked," said Mrs. Gay, "but I have no doubt as to how I should find things if I should look."

"How?" asked John.

"All perfectly right," said his mother. "There is no danger but that you will put everything in nice order for a while; and so I shall not think of looking to see whether you have broken the rule for some time to come. You will be very careful no doubt for some time; but at length, when you have become very much interested in your work, and have forgotten a little about the rules, *then* will come the time for me to catch you and call for the penalty."

CHAPTER IX.

TEACHING BENNY.

JOHN made a very serious mistake at first while going on with his mechanical operations, in respect to the mode of managing his brother Benny. His mistake arose not from any disposition to neglect his duty to his brother, under the agreement which he had made with his mother to act as his special friend and protector, but rather from an excessive desire to fulfil his duty in the most faithful manner.

He wished very much to teach Benny all that he himself had been taught by Ebenezer, and to have Benny learn to do all that he was learning to do himself. But Benny was not old enough to do this. He was only old enough to learn how to use his hands and arms, how to strike blows, and to turn a borer round and round, and to be amused with the splitting of a piece

of wood, — and other similar things, which, though they are of no special interest to a boy of John's age, are very amusing to one of Benny's. In a word, all that he was yet prepared to learn was mainly the use and command of his muscles, while the work that John was doing — which implied a close observation of form, and of magnitude, and a careful comparison of similar things in order to detect slight differences between them — was work for the mind and the brain; and Benny's mind and brain were not yet sufficiently developed for such operations.

John did not think of this, or rather he was not aware of it at all, and for several days he tried in vain to induce Benny to work to some purpose. At last he became quite out of patience, and he told his mother one evening, after Benny had gone to bed, that he could not do anything with him.

"He won't take any pains at all," said he. "He won't do anything but bore and pound at random; and he is not learning anything, and I can't make him. He turns it all into fun. I don't think I half earn the money you pay me for teaching him."

"But I don't pay you for *teaching* him," said his mother, "but only for keeping him amused and occupied, and that you do very well. You must not try to teach him what *you* are learning. He is not old enough for that. He is only old enough to learn more perfectly to use his hands and arms. So let him do just what he pleases."

"But he wastes the wood and the nails," said John, "by driving the nails in every way, and without doing any good at all."

"Never mind that," said his mother. "You can get plenty more blocks of wood from Ebenezer's shop; and as to nails, I can buy for sixpence enough to last him a week. And it is certainly worth a penny a day to have him amused and occupied in working with you."

"Besides," added his mother, "you can get back the nails he drives into the blocks by burning the blocks on the shovel in the kitchen-fire. Then the nails will be all left on the shovel, and when they are cool they will be as good as they were before."

"We *can* do that," said John; "I did not think of that."

"So you must not trouble yourself about

teaching him any carpentry," continued Mrs. Gay. "Learn as much yourself as you can, but let Benny turn it all into fun. Indeed, the more he turns it into fun the better; so you must help him make as much fun out of his work as you can."

This conversation presented the subject of Benny's carpentry to John in a new light; and he determined at once to follow his mother's advice.

Accordingly when he and Benny next went to work in their shop, as they called it, and Benny wanted a block and some nails to drive into it, John said he would give him some, and he advised him to play that he was building a house.

"Only," said he, "I must go and get a rag and some thread, and have it all ready."

"For what?" said Benny.

"To tie up your fingers when you pound them with your hammer," said John.

"But I am not going to pound my fingers," said Benny.

"Ah, yes," said John. "I am going to let you have a great many nails to play build a house, and when boys have a great many nails to drive, they always sooner or

later pound their fingers, even if they are as big boys as you.

"Besides," he added, "even grown men almost always have some accident in building a house ; so you must expect one. But I will get a rag and have it all ready."

So John went and got a rag, and a thread to tie it with, and laid it out with great ceremony upon the table.

But Benny said it was of no use, for he was positively determined that he would not pound his fingers.

John then went to work making two parallelepipeds for the ends of his box. Ebenezer had told him that he had better make the end-pieces of exactly the right breadth, but not to cut them off to the length until they were nailed on. It will be plain to the reader, on a little reflection, that these end-pieces were to be longer than the ends of the bottom of the box were, for they were to extend beyond the ends of the side-pieces also. Now it would be somewhat difficult and troublesome to ascertain by measuring beforehand exactly what this length should be. It would be made up it is true of the length of the end

of the bottom-piece, and of the thickness of the two side-pieces, but it would be somewhat troublesome to place these parts together and measure the whole distance.

Therefore it would be better, Ebenezer said, to make the end-pieces a little too long; and then, after they were nailed on, to trim off the excess carefully with a sharp knife.

"A broad chisel would be a great deal better," said he, "if you only had a chisel. The very first valuable tool that you buy must be a pretty broad chisel."

So John proceeded to the work of getting out the end-pieces of the proper width, while Benny went on driving in the nails.

"The way that boys pound their fingers," said John, "is this. They try to make a nail stick in the wood a little, so as to stand up by itself while they hammer it; but sometimes it won't stand up, and so they have to hold it, and in this way, when they try to hammer the nail, they hit their fingers. If they would always first bore a little hole with the gimlet to put the point of the nail in, and so make it stand up itself, there would not be so much danger of their hitting their fingers in *this* way."

"I am going to bore a hole first for all my nails," said Benny.

"But then," continued John, "there is another way that boys pound their fingers, and that is by not taking their left hand away far enough when they begin to strike hard blows on the nail, and in this way they hurt themselves dreadfully. This is the way Bill Booby did."

"Who was Bill Booby?" asked Benny.

"He was a boy that Ebenezer told me about," said John. "One day he was driving little nails, like you, into a board which he had upon the floor, and after he had set a nail into its hole he put his left hand down upon the board quite near to the nail. Then he began to hammer the nail in. But the nail would not go in straight, because he had not bored the hole straight. So he got in a passion and struck with his hammer at the nail as hard as he could, but instead of hitting the nail he hit his own thumb, and hurt himself dreadfully."

"Did he cry?" asked Benny.

"Cry!" repeated John. "He made such an uproar that he aroused the whole house. They had to put a poultice on his thumb,

and when they took it off they found that the nail had turned all black ; and finally the nail came off, though afterward a new one grew out in its place."

Benny paused from his work, and looked up with earnest attention while John was relating this story.

" But he learned two good lessons from this accident," said John.

" What two lessons ? " asked Benny.

" The first was," said John, " that when a boy is driving nails he must take care to keep his spare hand out of the way. And the second was, that he must not get in a passion with his work when it happens to go wrong.

Benny then proceeded with his work, but John observed that he was exceedingly careful in respect to hitting his fingers. For a time, in fact, while he was driving in a nail, he put his left hand away behind him. After a time, however, finding it somewhat inconvenient to hold one hand behind his back while he was driving with the other, he relaxed this excessive caution, and only removed the spare hand to a safe distance from the hammer.

As soon as John had finished his two side and two end pieces, he was ready to nail the box together. But here he came upon an unexpected difficulty. He had no boring instrument to bore the holes with, which was of the proper size for such small brads. His brad-awl, and even Benny's gimlet, were both too large.

His first idea was to take Benny's gimlet — although it was decidedly too large — and try to "make it do." But Ebenezer had told him that there was nothing so bad for a young workman as trying to "make things do," — that is to say, trying to use tools and implements for purposes that they were not intended for, and of course not adapted to.

"It takes a very good workman," said he, "to work with poor or unsuitable tools; and the reason why boys so often get discouraged and out of patience in attempting mechanical operations, and spoil their work, and damage their temper, is because they try to do something with a tool which is not intended for it, or with one that is dull or out of order. If your tool is not sharp, don't try to 'make it

do,' but wait until you have sharpened it; and if you have not got the right tool, wait till you can get it."

"But perhaps it is a tool that I can't get at all," said John.

"Then you ought not to attempt that piece of work," replied Ebenezer. "Never begin any piece of work until you have carefully considered whether you have the proper materials, tools, and implements to go through with it in a regular and workmanlike manner."

So John determined not to nail his box together until he had procured a brad-awl of exactly the right size for his brads; and as he had money enough to buy one, he determined that he would go to the store and get one the next day; for it was growing too late for him to go that afternoon.

Benny was now beginning to be satisfied with nailing, and John thought that it was time for him to form his plan for recovering the nails which Benny had used.

If now he had stated seriously to Benny that he did not wish to have all those nails wasted, and so was going to take them to the kitchen-fire and burn them all out again,

Benny would perhaps have objected to having all his work spoiled; and so, on the principle which his mother had recommended of turning all that he had to do with Benny as much as possible into fun, he proposed to him that after they had put their work away they should take his house out to the kitchen, and play that it took fire and burned up.

Benny was much pleased with this idea, and John showed him how to nail one or two narrow strips across from one of his blocks to another, so that they would stand up and form some rude resemblance to a house. The strips that went across he called the beams.

When this was done, the boys put away their work, and were very careful to sweep everything up clean. To make sure of this, they swept the carpet three times.

Then they went into the kitchen, carrying with them the house which was to be burned, and also a number of little bits of wood, and cuttings, which John had made in his work, and had reserved for this purpose.

"These are for the furniture of the house," said he.

"Let *me* carry the furniture," said Benny.

So John gave Benny the furniture, and together they went into the kitchen. There John placed the house upon the large kitchen-shovel, and Benny proceeded to put the furniture in. They then placed the whole in the corner, so that the smoke from the burning building might go up the chimney, instead of coming out into the room.

He then gave Benny a long slender stick, in order that he might light one end of it and so set the house on fire. The pretended furniture served as kindling wood, and the blocks themselves being dry and very combustible, notwithstanding the great amount of iron there was in them, the whole was soon all in a blaze, and the result was quite a conflagration. Benny was in an ecstasy of delight when he found that the beams themselves had taken fire and were blazing like the rest.

After a while the house was all burned to ashes. John then blew the ashes away with a pair of bellows, and carried the hot nails on the shovel and let them slide off

into a basin of water to cool them. He thought it would harden them, too, supposing that by heating them the temper had been taken out, and that cooling them suddenly would harden them again.

He was however mistaken in this, for the nails were made of iron, and not of steel, and it is only steel that is hardened by being suddenly cooled. Nails are somewhat softened, it is true, by being heated, but this is on a different principle from the softening of steel by taking the temper out, and the hardness is not restored by plunging them in cold water.

At any rate John recovered nearly all Benny's nails, and after pouring the water off from the basin and letting the nails dry, he carried them back and put them by themselves in one of the drawers, all ready for Benny to use again.

CHAPTER X.

MAKING A BRAD-AWL.

JOHN was relieved of the difficulty he was in in respect to a brad - awl of the proper size for the brads with which he was going to nail his box together, sooner than he expected, for that evening his uncle Edward called to see him, and made him a brad-awl.

This Edward, although he was really John's uncle, was a very young man, being not more than eighteen or nineteen years old. Thus he was in fact rather a boy than a man; but he was a very ingenious boy, and he took great interest in all John's occupations and amusements; and so when John showed him the pieces that he had shaped for his nail-box, and told him that he was waiting to buy a small brad-awl to nail them together, he told him that he would make him a brad-awl.

"It is a very easy thing to make a brad-

awl," said he, "that is, provided you can get a big needle."

"How big?" asked John.

"Why, as big as you want your hole to be," said Edward.

John immediately went to his mother, and she gave him two or three pretty large needles. There was one — a darning-needle — which Edward, after looking at the brads, said was of about the right size.

"That will do," said he; "and now the first thing is to make the handle."

So he looked in John's drawers and selected a long piece of wood, which was nearly square, and of about the right size for the proposed handle.

With this stick he went with John and Benny into the kitchen; and there, taking out his knife, which was very sharp and in perfect order in all respects, he proceeded to fashion one end of it in the shape of a handle.

"First," said he, "we make it square."

So he proceeded to cut away the four sides of the wood near one end, until he had made it as nearly square as possible, at the same time making it taper toward

the end. He examined the four sides repeatedly as he proceeded with the work, to see if they were exactly equal in breadth, and if the corners or edges where two of the sides came together were exactly square. Now and then he gave the stick to John in order that he, too, might examine it in respect to these points, and give his judgment upon them. This gave John an excellent lesson, by calling out his powers of observation, and cultivating his ideas of accuracy in respect to magnitude and form.

"Now," said Edward, "we must shave off all the corners, and make it eight-sided."

So he proceeded to do this. He shaved off the four edges, taking care to cut each one away just enough to make the new faces which he thus formed exactly equal to what remained of the old ones.

In shaving down these corners or edges in this way, Edward drew the wood along over his knee, holding his knife over it, with the edge in the proper position for cutting into the wood to the right depth. Boys very often use this mode for shaving down a long stick in an even and uniform manner, only Edward took care first to place a

small piece of cloth over his knee, to protect his pantaloons, — a precaution which boys in such cases very often neglect.

"A chisel would be better for this work than a knife," said Edward; "if you only had a chisel."

"Better than a knife?" asked John.

"Yes," said Edward; "the chisel is the carpenter's knife. You can cut more smoothly and uniformly with a chisel, after you have once become a little accustomed to it. The next tool that you buy, I advise you to choose a good broad chisel. You push it along over a stick like this, and the back of it, which is flat and smooth, serves as a guide, and keeps the edge from dipping in or turning out, as a knife is very apt to do."

By this time Edward had brought the stick pretty exactly to an octagonal — that is, to an eight-sided form. There were four sides to it originally when it was a square, and by shaving off all the four angles he had made four sides more. This made eight.

"Now," said Edward, "look at this stick and examine it carefully, and see if there

is any difference between the different sides."

So John took the stick and began to examine it. He found one side which near one end of it was a little broader than the adjoining sides. Then Edward shaved away one of the adjoining sides which seemed a little too narrow, until he had rectified the error.

"Now I will shave off all these eight angles," said Edward, "and then I shall have sixteen sides and sixteen angles, and then I will shave off the sixteen angles and that will give me thirty-two sides; — and thirty-two sides makes it round."

"Really round?" asked John.

"No, not really round," replied Edward, "but it will be so near to it that sand-paper will finish it. Thirty-two sides are as far as we can go with a knife or a chisel."

Edward said that there ought to be a ferule on the end of the handle, to prevent the wood from splitting when the shank of the tool was driven in, or by the force of the workman in boring with it.

"I wish I had a ring or a band of some kind," said he, "to put on this handle. You

had better save all the ferules that come off from old canes and umbrellas, to cut up and put on your tool-handles."

John said he had some rings among his playthings, and he went to find them. Presently he returned with two or three, one of which Edward said would do very well.

So Edward fitted this ring upon the end of the stick where the taper terminated, and then cut it off of the proper length, rounded the end, and finally sandpapered the whole with a piece of sandpaper which John brought him, — and the handle was done.

"Now," said Edward, "so much for the handle. The next thing is the awl."

So Edward took the needle which he had selected for the awl, and began to examine it attentively.

"We can't have any shoulder to it," said he, "to prevent its being crowded too far into the handle, but that is not very important for so small an awl. In every other respect we can make it all right.

"And the first thing to do is to square the shank, so as to prevent it from *turning* in the handle."

Benny had not the remotest idea what such technical language as squaring the shank could possibly mean. He stood by, however, listening with the utmost attention, and gazing upon Edward with an expression of curiosity and wonder upon his countenance.

"There are two ways that we might square the shank," said Edward. "I might grind the two sides of the needle flat where it is to go into the handle, or I might hammer that part flat."

"You can't hammer it," said John. "If you strike a needle with a hammer it will break it, it is so brittle."

"Ah," said Edward, "we must take the temper out first."

So saying, Edward took the needle by the eye-end with the tongs, and held it in the burning coals under the fire until it became red-hot. Then he took it out and laid it down upon the hearth, and let it cool slowly. While it was cooling he got a flat-iron, which he was going to use for an anvil, and holding it between his knees with the *end* up, he held the needle upon it, taking hold himself of

the eye-end, and proceeded to hammer it, from the middle toward the point, until it was somewhat flattened.

"Stop," said John, when he saw him ready to begin, "you are flattening the point. You want to flatten the part that is to go into the handle."

"That is the part which is to go into the handle," said Edward.

John had supposed that the point was to be used in some way for boring; but he was mistaken in this; for the needle, toward the point, tapers gradually all the way to the end, which renders it wholly unsuitable to serve for the boring part; since if the tip were formed at any place in this tapering part by grinding off the steel on each side so as to give it an edge, it would not bore well, for as the stem of the needle would gradually enlarge from the tip, the hole made by the cutting edge would not be large enough to allow the portion that followed to enter the hole easily, and so it would soon become wedged and stop the boring.

It is better therefore to use the point of the needle as the part to be *flattened*

and go into the handle, and to make the cutting edge at the other end, at the part where the needle widens a little just by the eye, which is exactly the form that is wanted.

When Edward had flattened the pointed end of the needle sufficiently, he drove it into the handle as far as it ought to go, taking care to examine it carefully from time to time as it entered, to see if it was going straight.

When it was in, he drew it out again with a pair of nippers, and broke off the point.

"What is that for?" asked John.

"To prevent its going in any farther," said Edward. "I kept the point to help me make the hole in the wood as far as I wished it to go in, but now I break it off to make it hard for it to go in any farther. We ought to have a shoulder; but that we can't make."

Having broken off the point of the needle, Edward then drove it in again as far as it had been before, and there it remained very firm. Then with the nippers he broke off the tip of the other end at

the eye, leaving a small portion of the widened part just below the eye, for the cutting part.

"Now is it done?" asked John.

"All but grinding it sharp," said Edward. "You could bore pretty well with it now in soft wood, but it will be better to grind it. But that will be a dreadful job. We shall have to take a candle and go out to the grindstone in the shed, cold as it is, and stay there till we grind it."

"How long will it take?" asked John.

"About half a minute," said Edward. "No, a quarter of a minute. One, two, three, four, five,—about as long as that for each side."

"Well," said John, eagerly, "I'll get some water."

"We don't need any water," said Edward, "and it would not do us any good if we had it; for water would freeze on the grindstone as fast as we should put it on."

"But it will take the temper out," said John, "to grind it without water."

"The temper is out already," said Edward. "We took it out when we heated

the needle in the fire. It is as soft as it can be now, and grinding it on a dry stone won't soften it any more. But I can easily harden it again when it is ground."

"Then we will go and grind it," said John.

"Yes," said Edward. "There are three of us—just enough for the work. Benny shall hold the lamp, you shall turn the stone, and I will grind the tool."

Edward accordingly took the lamp, and holding it in one hand and the new brad-awl in the other, and followed by the two boys, went out through the back-door of the kitchen into a long cold passageway, and thence through another passageway where there were several chests along the wall, and a pile of kindling wood in one corner, and from this to a closed shed, where he knew the grindstone was kept, near a window. It was very cold, and the sharp stinging air nipped the boys' ears and noses, and made them shiver. The windows which they passed were all frosted over with stars, and spangles, and plumes, and arborescent ramifications of every conceivable form.

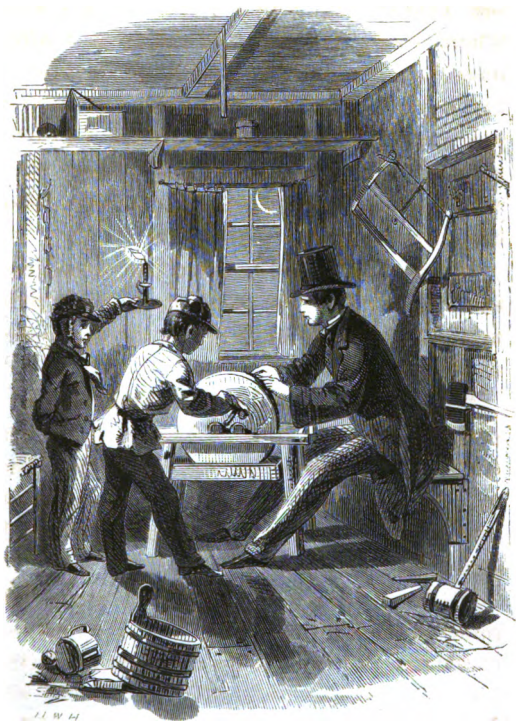
The party did not however stop for any of these things, but proceeded directly to the grindstone, which stood in a corner, where there was what is called a *shutter-window* on one side, and a glass one on the other. The glass window, although it was partly closed by a curtain, admitted through the frosty panes a silvery light which came from the moon shining upon the snow outside.

Edward, when he reached the grindstone, sat down upon a seat that was fixed against the wall on purpose for the grinder to sit upon.

"Now, boys," said he, speaking in a prompt tone of voice, "bear a hand and let us do this job up promptly. Turn, John, and, Benny, hold the lamp. Come close by. Hold it so that you can see yourself, and then I can see.

"There!" said he, after the stone had gone round four or five times, — "one side is ground," — then after a moment's pause again added, —

"There! both sides are ground." Then rising suddenly and taking the lamp from Benny's hand, he said, —



GRINDING THE BRAD-AWL. Page 144.

“Now we will see who will get back to the kitchen-fire first.”

So with a bound and scramble they all rushed back into the kitchen. Edward, though he pretended to be making all possible haste, managed to hold back a little, so as to let the two boys go in before him. John ought to have done the same in respect to Benny, but he was not so considerate. He crowded by Benny, pushing him somewhat aside, and got in first. Benny of course, being so much smaller and weaker, had no chance against him.

It is all very well for big boys to run races, and playfully make trials of strength with little boys; but if they have any manliness in them, they will always manage to let the little boys beat them in the end.

CHAPTER XI.

TEMPERING STEEL.

WHEN the boys had returned to the kitchen-fire and had warmed themselves a little, Edward examined the edge of the brad-awl, which he had formed upon the stone, and said it was all right.

"You might touch it upon an oil-stone," said he, "to make the edge a little sharper, but it will bore very well as it is, as soon as I get it hardened."

"I have not got any oil-stone," said John.

"You ought to have one," said Edward. "You can buy a small one,—a slip, as they call it—and set it in a block of wood yourself."

John was quite pleased with this idea, and would have made farther inquiries, but his attention was now at once taken up by Edward's arrangements for tempering the brad-awl.

"First I must harden the steel," said Edward, "and then temper it."

"I thought that tempering it was hardening it," said John.

"No," replied Edward, "not exactly."

He then went on to explain that by plunging steel into cold water when it was red-hot, it was made extremely hard and brittle. It was used in this state for files, and for some other purposes, but not for edged tools. An edge of this excessively hard steel would not stand, but would break away in cutting any very hard wood, and become jagged and dull.

So it is necessary to diminish this excessive hardness, or as they call it *temper* it, — tempering meaning simply to *moderate*. Thus temperate weather is moderate weather, and the temperature of the air is the state of moderation it is in in respect to cold. So a good-tempered boy is a boy whose passions are moderated and kept under control. It is true, we sometimes speak of *temper* simply, in a child, when we mean the indulgence of bad passion; but we always mean bad temper, in such cases, though we omit the word bad.

Edward held the point of the brad-awl in the lamp until it became red-hot, and then plunged it suddenly in cold water. This made the point extremely hard and brittle. It was only the point, and a portion of the steel at a short distance from the point, that he heated and hardened in this way. It was preferable to have the rest of the stem of the brad-awl left soft and flexible, for it would be better to have it bend a little rather than break, if by chance it should be strained too hard at any time in boring.

The heating of the point of the awl and plunging it in water, made the bright part, where it had been ground, black again. This was owing to a thin film of what is called *oxide*, which forms from the air upon the surface of iron or steel when it is heated.

The color of the film which is thus formed varies according to the degree of heat. First, it is a light straw-color, then brown, then as the heat goes on increasing, it becomes purple, and deep blue, and finally black. In tempering tools, the workman heats them gradually, after they have

been hardened, in order to "draw the temper," as he calls it; that is, to moderate the excessive hardness and brittleness.

He draws the temper more or less, according to the nature of the different tools that he is making, and the different purposes and uses that they are intended for; and he judges of the degree of heat by the color which the steel assumes. Thus straw-color denotes the temper for one kind of tool, brown for another, and blue for another. He heats his tool in the lamp, or in the fire, and sometimes in an iron basin filled with very hot sand over a stove or furnace, — and when it comes to the right color, that is, when the brittleness has been sufficiently tempered for his purpose, he plunges it into cold water.

If the tool is tempered down too low, then it becomes soft and flexible, and the edge will bend over, when you attempt to cut with it. If it is not drawn down enough, then it is brittle, and the edge will break away like an edge of glass. But between this brittleness on the one side and flexibility on the other, there is a mean, in which the two qualities are combined,

and what we call toughness is the result, and this makes the right temper for most tools.

Edward, after examining the awl a moment, asked a girl named Bridget, who was sitting by the fireside knitting, if she would let him have her Bristol brick — the one which she used in scouring her knives. So Benny brought him the brick from out of a closet near.

“What are you going to do?” asked John. “Are you going to sharpen it?”

“No,” said Edward; “I am going to brighten it a little on one side, so that I can see the color as I heat it.”

So Edward began to rub the awl carefully upon the Bristol brick, just as if the brick had been a whetstone and he was going to sharpen it. While he was doing this he explained to John that when he heated the awl and plunged it into cold water to harden it, it made the surface all black by forming a coat of oxide upon it from the air, and that he was now wearing this film off, so as to brighten the steel again, in order that he might see the color when he came to temper it.

As soon as he had made it bright he held the point of the awl in the flame of the lamp, watching the bright part intently all the time, to observe the change of color. Benny crowded his head up near to see too. John stood by with a cup of water, all ready for Edward to plunge the brad-awl into, as soon as he should find that it had attained the proper color.

The operation succeeded perfectly well. As soon as Edward saw that the straw-color began to appear, he dipped the tip of the awl into the water. It made a slight hissing sound, but was cooled almost immediately.

"There," said Edward, "now get a block of wood and see if the brad-awl will bore."

"Is it done?" asked John.

"Yes," said Edward, "all but oiling or varnishing the handle. If you had some oil it would be a good plan to oil the handle. It would make it look brighter, and it would keep cleaner and nicer."

"Well," said John. "Bridget can get us some oil."

"Ah, that kind of oil won't do," said Edward. "Any kind of oil that Bridget has

got would only make the handle greasy. You must have a *drying* oil,—such as painters use.”

There are some kinds of oil which harden and dry when exposed to the air, and this is the proper kind to put upon wood in such cases as this. The kind most suitable is what is called boiled linseed oil. You can get it at any painter's. When it is put upon wood it fills up all the pores near the surface, and hardens there, and so covers the surface all over with a thin coating like a varnish, and tends to make the wood keep bright and clean.

John said he was determined to get some boiled linseed oil the very next day, and oil his brad-awl handle.

The boys all went back into the sitting-room, and here John tried his new brad-awl and found that he could bore with it very well. A boy can make very good awls in this way out of large or small needles, and can make the handles too himself, as Edward did in this case, though to make a good one requires some time, patience, and care. Such awls are indeed not so good as those you buy, for they have no shoulder, and so

are apt to crowd into the handle in using them, if you attempt to bore into very hard wood. But with careful usage, and wood not too hard, they will answer very well.

Edward recommended to John to make some needle brad-awls, and also to make some handles for various tools. He told him that he might easily make handles for his files.

"And you will want one or two files very soon," said he, "especially a coarse, flat file, and a fine rasp for wood."

For rounding off the ends of his handle a fine rasp or a coarse file, he said, would be exactly the thing. After cutting it out in nearly the right shape with his knife, he could finish rounding it with a rasp or file better than with any other tool.

"The next money you have," said Edward, "buy a fine rasp, round on one side and flat on the other, and also a coarse file, flat on both sides; and there will be two handles for you to make. Then you can buy a set of brad-awls of various sizes, beginning with the needle-size and so on up to the largest, and make handles for them. You can buy the awls for two or

three cents a piece, if you buy them without handles. So with a very little money you can have a set of tools by which you can make any kind of hole you want, up to the biggest that can be made with a brad-awl."

On hearing this John determined that his next work should be to make two or three small brad-awls out of needles, and to make handles for them, and also to buy four or five others, from the largest of the needle-awls upwards, and make handles for them, so as to have a complete set.

"I mean to have the handles all exactly alike," said John.

"No," replied Edward. "It will be better for them to increase in size regularly as the awls themselves do. It is better to have the handles of tools different, than to have them alike. Then they catch the eye quicker, and you can the more readily get the one that you want."

The only difficulty was about ferules. To make a handle complete it is necessary to have a ferule — that is a small brass or iron band — around the end of it where the tool is inserted. Edward told John

that the long ferules that come upon the ends of umbrellas were excellent for this purpose. One of them he said could be easily cut up into four or five suitable for tool-handles; and as they are always made quite tapering, the parts cut off would be of different sizes, to correspond with the different sizes of the tools.

“How can I cut the pieces apart?” asked John.

“You can do that very easily with a file,” said Edward, — “a three-cornered file is the right kind. When you make your handle, shave down the small end till it is of just the size to be driven in about a quarter of an inch into the umbrella ferule. Then file a little notch in the ferule about where you think the end of the handle comes, and carry the notch all around by filing more and more. In this way the empty part of the ferule will be cut off, leaving a narrow portion on the handle.

“If you don’t hit precisely at the point where the wood ends, it is of no consequence,” said Edward; “for if the wood projects beyond the brass, you can cut the

part projecting off, and if it falls short you can drive the ferule on a little farther.

"In the same manner you can put what is left of the ferule on the next handle a size smaller, and so on until it is all used up."

The next day John began to work upon his handles, and he occupied all his working-hours for nearly a week in making different sizes of them, and in making and tempering brad-awls. At the end of the week he bought some files and also a number of large brad-awls, and fitted them into his handles, so that he had quite a number of very nice-looking tools, which he had procured too at very little outlay of money.

His plan however of oiling or varnishing his handles could not be carried into effect, for his mother was not willing that he should have oils and varnishes in the house.

"You must wait till the warm weather comes on," said she, "and then you can fit yourself some sort of shop out in one of the back-rooms, and there you can carry on the painting and varnishing business as much as you please."

John was satisfied that this was reasonable, and so he concluded to put off the work of giving the final finishing touch to his tools until the spring.

“ You see, Benny,” said he, “ the handles will all get soiled and worn by that time, but I can sand-paper them all up again before I put the oil on, and then they will look as nice as if they were new.”

CHAPTER XII.

THE TRAYS.

DURING all the time that John had been engaged upon his handles and his brad-awls his nail-box had remained unfinished until in fact he had almost forgotten it, though there the parts lay — the bottom, the two sides, and the two ends — all ready to be nailed together. It is true there was a good reason for laying the nail-box aside for a time, inasmuch as John had no suitable boring instrument small enough to make holes for the brads with which it was to be nailed together. But when his uncle had made the first small brad-awl, he might have taken the work up again and finished it; but he had become so much interested then in making handles and needle brad-awls that he forgot about his nail-box.

At last Benny recalled it to his recollection.

"John," said he, "when are you going

to finish your nail-box? You ought not to leave one thing unfinished and go off to work on other things, in that way, ought he, mother?"

"Not unless there is some good reason for it," replied his mother.

"I will finish my nail-box the very next time I work," said John.

The finishing of the nail-box John found was very easily accomplished. He had only to bore three holes near the edge of one of the sides, taking great care to bore them carefully so as not to split the wood, and also to bore them at such a distance from the edge that when the side was applied to the bottom, where it was to be nailed, the points of the nails should come as near as possible in the middle of the thickness of the bottom. After placing one of the sides, with the holes bored in it, in its place, he marked the places of the holes in the edge of the bottom-board, and then bored in a little way for each nail, taking care to bore in such a direction that the nails should enter straight into the substance of the board, and not run out on either side.

Then he nailed this side-piece on, driving

the brads in very slowly and carefully, so as to be sure that all was going right. If he found that a brad was going in the least degree wrong, he stopped in season, drew it out carefully with the claw of his hammer, and then, putting in his brad-awl, he cut away the side of the hole a little, on one side or the other, so as to alter the direction of it, and then put the brad in again.

When he had thus nailed on both the sides, he trimmed the ends of them off, to just the length of the bottom, and then nailed on the ends in the same way. The end-pieces of course extended beyond the breadth of the bottom, so as to cover the ends of the side-pieces. After the end-pieces were nailed on, John put one nail in at each of the corners, to hold the end-pieces and the side-pieces together, and the box was done.

I have been extremely particular in describing thus minutely all the steps of the process by which John made his first box, thinking it possible that many of the readers of this book may attempt to do the same thing, and they require very minute instructions in order to be able to succeed.

Any boy of John's age, who will closely follow these instructions, proceeding slowly and carefully, and without any hurrying or eagerness to get his work done at any particular time, will find that he can make a very neat box, of this kind, that shall be quite strong and serviceable, and of any shape that he may desire; and that without any tools or materials excepting some thin wood to make his box of, a board to lay upon the table to protect it, a sharp-pointed knife, some sand-paper, brads, and a brad-awl made of a big darning-needle.

If you wish to make a cover to your box, you can do so. There are different modes of doing this which I shall presently explain. I must, however, first finish what I have to say about the nail-box, and also describe briefly a sliding-tray which John made for one of his drawers.

His mother helped him contrive this tray. She was not much of a mechanic, it is true; but she took a great deal of interest in watching from time to time the progress of John's work, and she often assisted him by planning for him and making suggestions.

One day, when she saw him putting

away his tools and materials in his drawer at the close of his work, she observed that it was very difficult for him to keep them well arranged and in good order; for the drawers being large, and having no divisions in them, there was no other way but to put the large and small tools and large and small blocks together in the bottom of them. And though John took great pains to arrange them nicely, still the opening and shutting of the drawers made them roll about, and soon mixed them all up together. He had particularly no good place to keep such little things as his spare ferules in.

“If I only had some boxes,” said he, “to put some of my small things in, they would not get knocked about so much.”

“That would do,” said his mother, “but some sliding-trays, two for each drawer, will be much better, I think.”

So his mother proceeded to describe to him her plan of sliding-trays, and John determined at once to go to work to make them. These trays, his mother said, were made to extend across the drawer, one at each end of it, and they were made to slide

on thin strips of wood, which, she added, must be secured in some way to the sides of the drawer to serve as rails, as it were, for the trays to slide upon.

“I would rather not have them nailed to the sides of the drawer, if we can contrive any other way,” said she; “for in case we nail them, then if we ever wish to take them away, the nail-holes will be left,—which will deface the drawer.”

“The brads that I should use,” said John, “would make only very *little* holes.”

“Very true,” said his mother, “and I should not mind them much.”

They however finally contrived a plan which avoided the necessity of nailing anything to the drawers. The plan was this. John cut out two long strips of thin wood, about two thirds as wide as the drawer was deep, and set them up edgewise, one on each side of the drawer. Thus the lower edges of the strips rested upon the bottom of the drawer, and the upper edges formed the rails for the trays to slide upon. To prevent these two strips from falling over, or getting jostled out of place, John cut two narrow strips, like rulers, and made

them exactly of such a length as that by a little crowding they would fit in across the ends of the drawer between the two side-strips, and hold them securely in their places.

He then proceeded to make the trays, two for each drawer, one for each end. The trays were about eight or ten inches wide, and of such a length as exactly to extend across the drawer, along the ends, and rest on the two rails, and yet be loose enough to slide easily along them. He sand-papered the tops of these drawers and the lower edges of the trays, so as to make them very smooth, and then rubbed the surfaces with hard soap, as cabinet-makers do with the rubbing surfaces of bureau-drawers when they wish them to slide very smoothly and easily. John's trays fitted so well, and went so smoothly, that Benny found great pleasure in moving them to and fro.

Each tray was about three fourths of an inch deep, and the rails were of such a height that the top of the tray should come about an inch below the top of the drawer. Thus the whole tray and the space above

it only occupied about two inches of the depth of the drawer, which left plenty of room below in the bottom of the drawer for the things that were there, when the trays were moved to and fro. It was necessary to move them occasionally in order to gain access to the things in the bottom of the drawer that were under them.

John made the trays, of course, just as he had made the boxes, by first procuring a piece of wood of the right size for the bottom, and then fitting sides and end-pieces to them, and nailing them on.

He also made partitions in the bottom of the drawers and likewise in some of the trays, by fitting in narrow strips of wood. Thus in a short time he had a great many separate partitions and compartments in his three drawers, so that he could assort and arrange his various tools, and his stock of materials, in a very convenient manner.

He assigned some of these compartments to Benny, and Benny took great interest in keeping his shops, as he called them, in nice order.

John was employed several weeks in making these trays, and in fitting them all into

their places. During all this time his supply of tools had been gradually increasing, as he spent every week nearly all his salary in buying them. He had several files, but not so many as he would have liked, as he found that files were rather expensive. He had however a coarse flat file, for filing wood, and also a small three-cornered file, and a round, or rat-tailed file, as it is called. To all these he fitted good handles, and he kept them nicely arranged in one of his trays.

He also had two marking-awls, as they are called; but these he made himself. They were for marking out work with, and consisted simply of pieces of wire inserted in a handle and ground to a sharp point at the end. One of the marking-awls which John made was large, for large work, and another was very small, for fine and delicate work. This small one was made of a darning-needle. It was very easy to make this one, as the point of the needle, in its natural state, was just what was required for the point of the awl. He had nothing to do but to make the handle nicely, and then crowd the eye of the needle well up into it.

One day while John and Benny were at work in the back-hall, they heard a sound as of a heavy sled, or something of the kind, coming into the yard, and presently there followed a curious rumbling noise.

"What's that?" said John.

"I don't know," said Benny; "I mean to go to the window and see."

So Benny ran to the window and presently reported that it was Ebenezer who had come with a load of apples which he was letting run from his sled down a slide through the cellar-window, into a bin below.

"Good," said Benny. "Here is Ebenezer bringing us some more apples."

"I mean to ask him to come in and see my trays," said John.

So he went to the door and called to him.

"Ebenezer," said he, "I want you to come in, now you are here, and see my tools and trays."

"Not on *your* invitation," said Ebenezer.

"Not on my invitation," replied John.
"Why not?"

"I never go into any lady's house," said Ebenezer, "without an invitation from the lady herself, — that is, unless I go on business," he added.

And so he went on shoving the apples out of the sled into the slide.

"Well, *this* is business," said John.

"It is not *my* business at any rate," said Ebenezer.

John paused a moment as if at a loss what to say or do. He then disappeared from the door, but soon returned saying, —

"Ebenezer, mother says that if you have time she would like very much to have you come in and see my drawers."

"Very well," said Ebenezer. "I'll come."

So when Ebenezer had finished putting down the apples he came in. He seemed quite surprised to find how neatly John had made his trays.

"You must have worked very patiently and carefully to do that," said Ebenezer.

"All the corners kept up very well," he added, after examining very particularly the corners of the pieces which formed the sides and ends of the trays.

"The corners?" repeated John.

"Yes," replied Ebenezer. "The chief difficulty with boys when they undertake to make a parallelepipedon is, they wear down and round off all the corners of their work. The great thing in shaping wood is to take care of the corners."

"I think they are pretty good trays," said John.

"They are, indeed," replied Ebenezer.

"Mother likes them so much, that she says she wishes I would make a pair of trays for one of her drawers. She wants them to keep some of her little things in."

"You could make her some very neat trays," said Ebenezer; "and if you could only *dowel* them on the sides."

"Dowel them on?" repeated John.

"Yes," said Ebenezer. "In dowelling them, there are no nail-heads to show on the outside of the box or tray, but the fastenings are all out of sight."

"How do you do it?" asked John.

"I can't stop to tell you now," said Ebenezer; "but the next time you come to my shop, while I am at work there, I'll tell you all about it. It's a pretty nice

operation, but I should think that perhaps you might do it very well. Have you got a pair of cutting-pliers?"

"No," said John. "I don't even know what cutting-pliers are."

"A pair of cutting-pliers would be very handy," said Ebenezer, "but you can do very well with a file. But I advise you, the first time you get half a dollar to spend, to buy you a pair of cutting-pliers."

CHAPTER XIII.

LAW QUESTION.

THE first time that Mrs. Gay called upon the boys for a penalty incurred in breaking one of her rules, quite a serious law question — that is a question about the interpretation of the law — arose. The case was this.

John was engaged that day in putting in partitions into some of his trays. To do this, all that he required was his small brad-awl to bore holes for the brads, and a hammer to drive the brads in. He did this work at the table, making a bench for it for the occasion by means of his protecting board.

Such work as this of course makes no chips or borings, for the brad-awl, as has been already explained, brings out no wood from the hole which it makes, but only crowds the fibres aside as it goes in. Consequently John knew that his work that day was clean work.

While he was thus engaged, Benny was very busy upon the floor, near the chest-bureau, splitting wood with what he called a beetle and wedges. He had a small mallet which John had made for him by first boring a hole in a round stick of wood by means of a small auger that he found in the shed, and then sawing off the wood about an inch and a half each side of the hole, and finally fitting a handle into the hole. Then the mallet, or the beetle, as Benny called it, was complete.

John did this work very well, for although he had never attempted to make a mallet before, he had corrected his eye so much, and trained his hand so well by his careful work on his boxes and trays, that he could perform any mechanical operation much more exactly and more successfully than at first.

This is the reason why I have been so particular in describing all the minute steps of the process in making a simple box, for if a boy faithfully and carefully follows these directions, he will not only learn to make a box well, but will do

everything that he undertakes better than he would have done without this training.

Such work as this, they say, "educates his ideas."

With this mallet and some wedges Benny was splitting wood. He had a piece of wood—one of the pieces which the boys had procured from under the bench in Ebenezer's shop—which he was splitting up. The piece of wood was about a foot long, and Benny was playing make shingles with it. He had a case-knife which Bridget had lent him. With this he made a little cleft in the end of the wood, to insert the edge of his wedge into, and then drove in the wedge with his mallet. In this way, as the wood was very straight-grained, he could split off a series of long and thin pieces; and as he made the pieces very thin, the wedge split them off quite easily.

"John," said he, "I am making some very nice shingles indeed."

"Let me see one of them," said John.

So Benny carried some of his shingles to the table to show them to John. John said they were very nice indeed. He said

moreover that perhaps that was the way that people made matches.

So he took one of John's strips, and laying it down upon his board, he found that with a ruler and a knife he could cut it very easily into long and slender bars, about as large as matches, only they were a foot long.

"I verily believe these would make good lamplighters," said he, "instead of paper ones, which make so much black ashes to fly about the room. Go out in the kitchen and ask Bridget to try one of them, and see if it will burn well, and ask her if she thinks it would make a good lamplighter."

Benny went, and pretty soon he returned, saying that Bridget said it would burn very well, and she thought that such strips would make excellent lamplighters—much better than paper ones. They would last a great deal longer, and would not make such black flakes to fly about the room.

Benny then went and showed the new kind of lamplighter to his mother, and she seemed as much pleased with it as



H. W. H.

MATCH-MAKING. *Page 144.*

Bridget had been. So the boys determined to make up a quantity of them, and John told Benny that if he would split out the strips, he would afterward cut them up into lengths; and Benny went to work accordingly.

He seemed to be very much delighted to find that he could make something that promised to be of real use,— so that here at least was one exception to the general principle which Mrs. Gay advanced, as related in the first chapter,— that it was sufficient that anything should seem to tend to some useful result, to spoil it as an amusement for children.

Now it happened that when Benny went to the table where John was working to show him his shingles, he brought with him, upon his clothes and upon the pieces of wood that he had split out, a number of slender little splinters, some of which, while he was standing there talking, fell down upon the floor, where, as the floor was covered with a painted carpet, of rather light colors, they did not show much, and neither of the boys observed them. Benny went back to his

place and proceeded with his splitting, and the boys continued their work, each in his own place, until the time expired. Then, when they put their things away, they swept up very carefully, three times, all the chips and splinters about the place where Benny had been at work, but thought nothing of the place near the table, because John had not been doing any work there that could make any litter.

The next morning, just before breakfast; Mrs. Gay asked the children to go out with her into the back entry, and pointing down to the floor near the table—

“There!” said she. “Look. Don’t you think the cat could find out that some mice had been nibbling here? It seems to me there is a penalty to pay.”

•“It was John,” said Benny, “that did that. That was where he worked.”

“But I did not do any work that could have made any chips,” said John. “I was only boring with a brad-awl and nailing. It *could not* have been me. It must have been that Benny brought them here, when he came to see me work, some time.”

John had forgotten about Benny's coming to show him the shingles, but thought it probable that he came, as he often did, to look over him at his work.

Thus there arose at once a very grave question. There was no doubt that a penalty had been incurred. The difficulty was to determine who was the culprit that had incurred it.

It is one of the most difficult things in the world to make a law that shall not be liable to some doubt or uncertainty when you come to the practical interpretation of it. Mrs. Gay thought that the rules she established were very explicit and precise. If there was the least perceptible indication of the boys having been at work to be found upon the floor, the boy that was in fault was to pay a definite fine; but she had left unprovided for the contingency which had now occurred, namely, the not being able to determine which one was in fault!

"Very well," said she, "I give up the penalty this time. The rogue escapes, as rogues often do, through the imperfection of the law. But from and after this time I

shall amend the law thus, that if it can be ascertained which of you was in fault, then only that one shall pay the penalty. But if we cannot ascertain, then both of you must pay, John two cents and Benny one."

"Ah, mother!" said Benny, "that would not be fair."

"Yes," said his mother, "anything is fair that I offer as conditions on which I let you have my drawers, and that you accept. Besides, that is really the way that all laws work. If any wrong is done, and the guilty one can't be found out, the whole community suffer more or less for it."

So it was settled that the law should be amended as Mrs. Gay had proposed.

It may be imagined by some of my readers that Mrs. Gay was somewhat disappointed and chagrined to find that she failed to secure the penalty of the broken law in this case. But, far from that, she was much pleased. She was glad of any excuse for not taking away a part of the boys' salary, provided it did not tend to make them more careless in time to come; and she was quite sure that, releasing them in this case for the reason above given,

would not have that tendency in any degree. It would rather have a contrary tendency, for the conversation to which the incident had given rise, and the ground on which the penalty failed of being enforced, would, she knew, make them doubly careful, at least, for some considerable time.

Mrs. Gay was so much pleased with the lamplighter which John and Benny made, that she said she would pay two cents a dozen for three dozen of them. They were not only neat and convenient for use, but they gave out an agreeable resinous odor, she said, in the burning. She called them the patent aromatic lamplighters, and when the three dozen were made and brought to her for delivery, tied up in three neat bundles of one dozen in each, she paid the six cents, which the boys divided equally between them.

CHAPTER XIV.

DOWELLING.

THE next time that John went to Ebenezer's shop, Ebenezer explained to him the process of dowelling. This is rather a nice process, it must be admitted, but the effect is excellent, inasmuch as the nails by which the two pieces of wood are held together by it are perfectly concealed. It requires some patience and a good deal of careful attention, it is true, to do it well. But yet the process is so simple, that any boy of ordinary ingenuity can do it. John taught Benny how to do it, and he succeeded in dowelling two blocks together quite well, and when he had done it, he carried the work to his mother, and asked her to see if she could find out how those blocks were fastened together, and she could not.

It was a stormy day when John went to Ebenezer's shop to learn about dowelling. He almost always chose stormy days for going there, for in pleasant weather Eben-

ezer was generally employed in out-door work. He found Ebenezer engaged at work upon his lathe.

Ebenezer was trying to make himself a lathe, which is a small and very curious machine for making all sorts of round things, such as round boxes, rings, handles, spindles, round bedposts, table-legs, and the like. He had been at work upon this lathe for some months, doing a little at a time as he had leisure; and on the day when John went to see him he was making what is called the fly-wheel, which is a heavy wheel placed on the axle below, to give the lathe when it is going a sustained and steady motion. There is always a fly-wheel in a sewing-machine. You will see it by looking at the lower part of the machine, under the table. It is generally placed at one end of the axle, where it is out of the way. The use of it is to make the machine go on steadily when it is put in motion.

"Now, Ebenezer," said John, "I have come for you to show me how to dowel."

"I can't stop to show you very well," said Ebenezer; "but I can tell you."

"I don't think I can understand very well," said John, "unless somebody shows me."

"Then you must show yourself," said Ebenezer, "and I'll tell you how."

"First look under the bench and find two small blocks. No matter what shape they are, only you must suppose that you are going to make a box, and you must take one of them for the bottom and the other for one of the sides. Take them out to the other end of the bench where there is room for you to work."

John did all this, and taking his place at the end of the bench, he put one of his blocks down flat upon it, and brought the other up to the edge of it in the position of a side.

"The side is too long," said John.

"That's no matter," replied Ebenezer. "You can learn how to fasten them together just as well for all that. Now go and get a couple of brads out of my small nail-box, and a brad-awl of the right size to bore for them. It must be a little smaller than the brads."

Ebenezer kept all his tools and materials

in such excellent order, and John was so well acquainted with the arrangement of them, that he knew exactly where to go for them.

Ebenezer then took out from one of his drawers an instrument which he said was a pair of cutting-pliers. These pliers were shaped like nippers, with a pair of flat jaws, and near the joint a small pair of cutting edges, made for cutting off small wires, and nails, or any small bars of metal.

"I can trust you with these pliers," said Ebenezer, "but I could not trust every boy."

"Why not?" asked John.

"For fear that they should serve them as Bill Booby did his. You see Bill Booby saw me using my pliers, and when he found that they really cut off a wire as easily as you can cut a thread with a pair of scissors, he was so much pleased that he went home and teased his mother to give him half a dollar to go and buy him a pair.

"When he got home he went with his pliers all about the house showing them to everybody, and cutting off pins with them. This was all very well; for pins,

being made of brass, are pretty soft, and can be cut very easily. But then he went to cutting bigger things. He got the biggest wire he could find and tried to cut that off. Now the edges of the cutters in such pliers are tempered extremely hard, because they have to cut metal. This of course makes them brittle. To remedy this the jaws are made very thick, and with proper usage they will never break. But when you attempt by main force to cut something that they were not intended for, of course the edge breaks down. Bill Booby tried to cut a darning-needle in two with his, but that being made of steel, and hardened, would not yield. So he took both hands to his pliers, and pressed them with all his might, when — crack ! he heard something give way, — and, looking, he found a notch in the edge of his cutters. The needle was whole as ever.

“ Now that he had broken his cutters in one place, he did not care much what became of them, so he went cutting at everything that he could find until he had notched the edges all up. He even tried to cut a *key* in two with them.”

"Hah!" said John, "what a fool!"

"Yes," said Ebenezer. "Booby he is by name and booby by nature. In the end the cutters were all notched up and spoiled.

"But now for the dowelling," continued Ebenezer. Take up one of the brads and look at the head of it. You see it is formed by a little projection of the iron on one side."

"Yes," said John. "I see it."

"Now cut off that projection with the pliers; then you will have what you may call a headless brad. It is pointed at both ends, or rather it is not pointed exactly, for brads are always blunt; but you can drive it either way if you first make a little hole for it. Now cut off the head of another in the same way."

When John had prepared his two brads, he proceeded thus, — following step by step the directions Ebenezer gave him. First he bored two holes very near the edge of his side-piece, and on the inside of it, that is on the side that was to come against the edge of the bottom-piece. He made these holes at some distance apart, and

took care not to bore them entirely through the wood. Then he drove in the two brads, putting the heads, or rather the ends that the heads had been cut off from, into the holes, and driving gently on the *points*. The holes were deep enough to take in about half the length of the brads, and as they were somewhat smaller than the brads themselves were, the brads went in tight and were very firm.

Thus, on looking on one side of the side-board, you could see the points of the nails projecting, as if they had been driven through, but on turning the piece over and looking to the back side, there were no heads to be seen.

John then pressed the points of the nails against the edge of the bottom-board to mark the places where the holes were to be bored there, and then carefully bored the holes. Then he inserted the two points of the nails into the holes; and finally, turning the wood down in a proper position on the bench, and striking on the back of the side-board with the hammer, he drove them in. The side-board was thus nailed tight to the edge of the bottom-

board, while the nails themselves that held the pieces together were entirely concealed from view.

"Only," said John, "I have bruised the wood of my side-piece a little by pounding on it."

"Yes," replied Ebenezer. "But when you are dowelling in earnest, you don't strike directly upon your side-piece, but put a block of wood upon it and strike upon that."

John was much pleased to find that dowelling was so simple a process. He thought that he could fasten the parts of his mother's tray together in that way, if he only had a pair of cutting-pliers to cut off the heads of the brads with. Ebenezer told him that he *might* file them off.

"Drive the brad a little into the end of a stick," said he, "so as to have a handle to hold it by, and then you can rest the head of it on your bench and file off the projection. But the best way for you now will be to take a dozen or two of my brads, and cut the heads of them off here, with my pliers; only you must pay me for them."

"How much must I pay?" asked John.

"You must pay me in work," said Ebenezer. "You must turn the grindstone for me, while I grind some of my tools that are getting dull."

So John turned the grindstone for nearly half an hour, while Ebenezer sharpened his tools, and then he went home carrying with him two dozen headless brads in his pocket for dowelling.

He succeeded very well in making the trays for his mother's drawers by this method; and Benny too, as has already been explained, dowelled two blocks together.

"Who showed you how to do it?" asked Benny.

"I showed myself," said John, "though Ebenezer told me how."

Before concluding this chapter I ought to say that such dowelling as I have described, with small brads, will not make very strong work, without glue; but if you glue the joint before closing the parts together, it will be very strong indeed—the brads holding the pieces in close con-

tact until the glue is dry and hard. But without glue the joint is strong enough for trays to go into drawers, and for boxes not subject to rough usage.

To make boxes stronger, workmen use longer brads. Sometimes they use slender nails, or pieces of round wire cut to the right length. For dowelling the parts of furniture together, the workmen generally use round pegs of hard wood, which, being made larger, hold better. They have a particular borer to bore the holes for these pegs, which they call a dowel-bit.

CHAPTER XV.

PROGRESS.

THE great thing in mechanical operations, as in everything else, is to get well begun; and after John had proceeded as far as is described in the foregoing chapters, his progress was very rapid and very satisfactory. He accumulated quite a number of tools and implements, a great many of which were made by himself. He procured several sheets of sand-paper of different degrees of fineness, and glued them upon boards, by which means they were kept flat and distended, and he could rub down his wood upon them much more conveniently than when they were loose. Besides these he prepared several small blocks by covering one side and sometimes one edge of each with sand-paper, and these he used as rasps and files, finding them more convenient for some purposes than the large sheets.

He bought with the money which he obtained by his salary a broad chisel, a pair of cutting-pliers, an oil-stone to sharpen his tools upon, and a little oil-can. The oil-can was of the kind used for sewing-machines, and had only a minute opening at the top of a slender pipe for the oil to come out at. His mother was willing, she said, to waive her objection to his using oil about his work, so far as a little oil-can for his oil-stone was concerned.

John bought his oil-stone very cheap, for it was not set in a block of wood when he bought it, and was moreover not very large. He set it himself. The usual way of setting an oil-stone is to cut out a hole in a block of wood large enough to receive it, by means of a mallet and a chisel. But to do this well you require a vice to hold the block of wood firmly during the operation.

Now John had no vice, so he adopted the following plan to make the bed for his oil-stone to lie in. He selected a block of wood of the proper size, which he called his foundation block. He then

took a thin piece of wood,—one that was somewhat thinner than the stone itself,—and cut it out almost exactly to the size of the foundation block, only a very little larger. He marked out the size of his oil-stone on this thin piece, as near the middle of it as he could, and then cut out the wood within the mark so as to make a square hole. To do this he first bored a row of holes all around the boundaries of the hole, just inside of it, and then, after taking the *core*, as he called it, out, he trimmed and smoothed the edges with his chisel and his knife, until the stone would exactly fit into it.

Finally, John dowelled the thin piece which had the hole in it upon the face of his foundation block, and thus the bed for the stone to lie in was formed.

As soon as his oil-stone was done, John took a great deal of interest in sharpening all his cutting edges upon it,—his knife, his chisel, and even his brad-awls. Always when he had done sharpening his tools he wiped the oil-stone clean before he put it away. He had a large number of little square pieces of

cotton rag, one of which he used for this purpose on every occasion of using the stone. He called these pieces his towels, and kept them in a pile in the corner of one of his trays.

This oil-stone was probably the most useful thing he had, and the work which he did upon it was of more value to him, in respect to his mechanical education, than any other work that he did. It gave him a clear idea of an *edge*, and of the proper mode of producing one, and of the differences in the angles of inclination which are formed by the sides of the blades of different tools, according to the nature of the several substances which they are intended to cut.

He became so much interested in *edges* by this work, that he examined those of the knives in the kitchen, and of the different pairs of scissors and shears which he found in the house, and he obtained a great many new ideas on the subject, which proved afterward of great advantage when he came to have bench-tools.

For thus far, notwithstanding the number of tools which he and Benny had,

and the many things they could do with them, he had no bench-tools at all.

The principal bench-tools are planes and saws of different kinds, a shave, a mallet, and a set of chisels. But none of these things can be used to advantage without a bench and a vice; and even if they could be, they are not at all the proper things for a boy to begin with in learning to work with tools.

There is a way of using a plane and a saw upon a table in the house or upon the top of a bureau, for small work, which will perhaps be described in the next volume of this series; but it is of no use for a boy to attempt anything of this kind until he has made some progress in "educating his ideas" by preliminary operations of a similar character like those which John performed, by means of his protecting board on the table.

John tried to make a cover to one of his boxes. This box was of a long and narrow form, and was intended to be put upon a desk to hold pens and pencils. John made it out of thin pieces of mahogany, which he obtained from a cigar-box that he contrived to get in the town.

The cover which John fitted to this box was made to shut down upon the top of it, without hinges. He made it by cutting out two pieces of wood, one a little larger than the top of the box, and the other just large enough to slip into it, and then dowselling the two together, the smaller piece on the under side of the larger one. Then he rounded over the edges of the larger and upper piece, so as to make it smooth and easy to take hold of, and the two together made a very pretty and convenient cover, inasmuch as the lower piece, being just large enough to enter into the box, served to close it tight and keep the whole cover in its place, while the upper prevented it from going down too far, and also served to take it off by.

This box was so neatly finished, and the wood, moreover, being of a species of mahogany, was so pretty when it was nicely smoothed with sand-paper, that Mrs. Gay recommended to John to take it to the cabinet-maker's and have it varnished. This he did, and when the box was dry and he brought it home, it looked as nice as if it had been *made* at the cabinet-maker's,

instead of having been merely varnished there.

There are many other ways of making the covers to boxes both with and without hinges. When the sides of the box are too thin to put on brass hinges, then a kind of hinge which answers a very good purpose may be made by means of wire. You cut off four pieces of wire about three quarters of an inch in length, and bend them into the form of a long and slender *U*, thus making two pairs of what are called *staples* of them. One staple of each pair is then inserted into the edge of the back side of the box, near the two ends, and the other staples, after the sets have been hooked together, are set into the back edge of the cover. Of course holes must be bored for the branches of the staples to go into, and it is better if the wire is roughened by means of a file, or by cutting around it a little with the cutting-pliers, so as to make it hold better in the wood.

It is, however, rather a difficult and delicate thing to make hinges like these so that they shall work really well.

CHAPTER XVI.

ABOUT MARTINS.

TOWARD the close of the winter John became engaged in what was for him a great undertaking. It was that of cutting down in the woods a tall and slender tree, and hauling the stem of it to the house, to be set up in the spring for a martin-pole.

What put this plan into his head, was a conversation which he had with Ebenezer in respect to a martin-house that was fixed upon a pole in Ebenezer's yard, and which, though empty and desolate at this season of the year, was always well filled with martins during the summer.

When John came home and announced his plan to Benny, Benny said, —

“But, John, you have not got any martin-house to put on your pole.”

“I mean to make one,” said John. “Ebenezer says I can. Perhaps it won't be made very well. but that's no matter. Eb-

enezer says the martins are not particular at all about the finish of their houses. All they care for is to have the house up very high, out of the reach of the boys and the cats."

"Then you'll have to make your pole very high," said Benny.

"I mean to make it twenty feet high," said John, — "or thirty. I've a great mind to make it thirty."

"You had better make your martin-house before you get your pole," said Benny. "At least, that's what *I* think."

"No," said John; "I will make the house afterward. You see I must get the pole *now*, while there is snow on the ground, so that we can haul it home on our sleds."

"We could not put such a long thing on either of our sleds," said Benny.

"No," replied John, "but we can put it upon two of them. We will put the big end on the biggest sled, and the little end on a small sled, and then we can haul it along very well. That's the way they haul long sticks of timber and masts."

"We can't get such a long thing through the gates," said Benny.

"It will be hard," said John, "but we can do it."

"We had better get uncle Edward to help us," said Benny.

"No," said John, "I would rather that we should do it all ourselves. But I will ask uncle Edward what he thinks about the plan."

In accordance with this intention, John did ask his uncle Edward about the plan, the next time he saw him.

"Uncle Edward," said he, "what do you think of the plan of my having a martin-house?"

"I think it is an excellent plan," said Edward. "I like martins very much. They are the only animals that I know of that give pleasure only — without any pain or trouble to counterbalance it."

"Is that really so?" asked Mrs. Gay, who was listening to the conversation.

"Yes," replied Edward; "it really is. Other animals give a great deal of pleasure to their owners, but they all make more or less trouble, and are sometimes the source of serious pain."

"A dog is not any trouble," said John.

"Yes," replied Edward; "dogs, on the whole, make a great deal of trouble. Sometimes they bite you. Sometimes they howl in the night, and keep you awake. They make you afraid very often that they are going mad. They bark at people going by, or at the friends that come to see you, and frighten them."

"A canary-bird?" suggested Mrs. Gay.

"A canary-bird sings very prettily," replied Edward, "but it is a great care and trouble to see that he is fed, and his cage put in order every day. Besides, you can't help pitying him in being kept so close a prisoner all the time, when he longs to escape from his wires, and fly away; and then just as you begin to get strongly attached to him he takes it into his head to die, or the cat catches him, and that breaks your heart.

"So it is with all animals," continued Edward, "except martins. There is some trouble or difficulty with all of them. Cats steal the milk and cream, and kill the little birds that come about your door. Rabbits look very pretty hopping about the yard, but they gnaw off the buds of the shrub-

bery, and the bark of the young trees. Doves have to be fed every day, and besides that they quarrel among themselves, and if one of them is weak and feeble from any cause, the rest peck at him and drive him away from the dove-house. Peacocks and parrots make hideous noises that disturb all the neighborhood. Hens scratch up the beds in the garden. So it is with all the animals that I ever heard of. There is some trouble connected with every one except martins. But with them there is no difficulty at all. All you have to do is to make a house for them and set it on a tall pole. They will come of themselves and take possession of it, and never make you any trouble. You never have to feed them. They get their living by clearing the air all around your house of gnats, mosquitoes, and other noxious insects. They amuse themselves all the morning in frolicking about their pole, chirping and singing in a way to fill everybody that hears them with gladness and joy. When the summer is over they disappear, and take care of themselves somewhere all winter, without giving you any trouble; and when any of them die,

you never know it, and so you do not even have to mourn the loss of them."

John laughed and exclaimed at the same time, —

" Oh, uncle Edward ! "

" So I fully approve of your plan of making a martin - house," said Edward, " and I 'll help you about it, if you think you will need any help."

" We would rather do it all by ourselves, if we can," said John, — " Benny and I."

" I think very likely you can do it," said Edward, — " all except raising the pole. The pole itself will not be very heavy, but you will have to fasten the martin-house to the end of it before you put it up, and that will make it very heavy. I shall have to help you about that.

" And I will give you some advice, too, about the work in general, if you like," added Edward.

John said that he should like the advice very much.

CHAPTER XVII.

GETTING THE MARTIN-POLE.

EDWARD accordingly proceeded to give John and Benny his advice about getting the martin-pole. He told them of a place in the woods, not far from a road, where a great many small but tall and slender spruce-trees grew together.

“ You can get long and slender poles,” said he, “ only in the woods, where the little trees grow close together; for when trees grow separate from each other, they throw out a great many branches at the sides, and that makes the stem of the tree comparatively short and stout. But in the thick woods the side-branches are very few and insignificant, and the body of the tree is long and slender.

“ When you have chosen your tree,” continued Edward, “ you must decide which way you will have it fall. If it leans a little either way, then it will fall the way it

leans. If it does not lean at all, then it will fall on the side on which you make the deepest cut. So you must look out for an open place among the other trees where it will not get lodged in falling, and cut it almost entirely off on that side. Then, when you are ready to have it come down, tell Benny to stand out of the way, and cut a few strokes on the other side. As soon as you see it is beginning to bend over, drop your axe and run for your life, for fear that some of the splinters from the dead branches should hit you."

"Won't it be dangerous for them?" asked Mrs. Gay.

"No," said Edward, "it is not dangerous for such a boy as John to fell a tree like that, — but it would be dangerous for him to trim off the branches with his axe, afterward, the axe is so liable to glance in trimming off branches. So he had better trim up his pole with a saw. It won't need much trimming, however, if he gets it out of thick woods.

"Then," continued Edward, "when you have felled your pole and trimmed it up, put one of your sleds under the but-end of

it, and the other half-way to the other end, and haul it home."

"I am afraid the but-end will be too heavy for me to lift," said John.

"Then," said Edward, "you must lay skids as you have seen Ebenezer do, and you and Benny must pry it up.

"There's one thing you must not forget," said Edward, in concluding his advice, "and that is to get leave to cut the pole from the owner of the land. It is Mr. Greenwood's land."

"Then I'll get leave from Ebenezer," said John.

"Perhaps there'll be something to pay," said Mrs. Gay.

"Not much," said Edward.

"I hope there will be *something*," replied Mrs. Gay; "you must tell Ebenezer, John, that if he will tell you what the pole is worth, I will send him the money."

"I've a great mind to ask Thomas to go with us," said John.

"I would," said Benny.

Thomas was Ebenezer's brother.

John and Benny went that very day

to see Ebenezer about the martin-pole. When Ebenezer heard their plan, he said his father would give them a pole he had no doubt; but on John's telling him that his mother would prefer to pay for one, whatever it was worth, Ebenezer said that he might have any one that he could find that was not more than eight inches through, for ten cents.

"But I don't see how I can measure it *through*," said John.

"Ah, we don't have to *measure* it through," replied Ebenezer; "we measure it *round*, and then take one third. It is three times as far round as it is through."

"Exactly?" asked John.

"No, not exactly," said Ebenezer; "but near enough for such purposes as this. To get a pole eight inches through, you must find one twenty-four inches round. I'll give you the measure."

So saying, Ebenezer took a string, and measured and cut off a length of two feet from it, by means of his iron square, and then gave the string to John to put in his pocket.

John also made an arrangement with

Thomas, Ebenezer's brother, to go with him and Benny the next morning into the woods to get the pole, and to take his sled with him; for Thomas's sled was a large and strong one, and had broad and flat runners which were much better than narrow ones for going over loose snow, — though narrow ones are better where the roads are hard and smooth. He was to be ready at half-past eight o'clock the next morning, at which time John and Benny were to come for him, bringing with them the ten cents to pay Ebenezer for the pole.

In accordance with the arrangement thus made, John and Benny took the biggest sled they had, and proceeded to Mr. Greenwood's house to call for Thomas to go with them for the martin-pole.

With the sled John took his little axe, and also a small saw which his mother lent him, — one which was used chiefly for pruning trees, by Wilmot the gardener.

John had also provided himself with the money to pay Ebenezer, and had put it safely in his wallet, where it lay in the next compartment to the one where he had put

the two-foot string with which he was to measure the tree.

"I have n't lost my measure," said he.

"Whereabouts are you going to measure?" asked Benny. "You ought to measure close to the ground, and you can't get down to the ground, because of the snow."

"I shall measure where I am going to cut," said John. "That will be fair."

"Then you 'll cut down a tree bigger than he agreed to let you have," said Benny. "For it is bigger at the bottom."

"No," replied John; "he agreed to let me have a *pole* eight inches in diameter at the butt; and the butt of the pole will be at the place where I am going to cut it off. However, I'll ask Ebenezer."

It must be confessed that this question, though not really a very important one in respect to the value at issue, was quite a nice one in respect to the principles involved, and John came to a very wise conclusion in determining to ask Ebenezer about it. It is always best in such cases, before you take any property, to be sure of your title to it. It is much better to have a little smaller pole, and feel that it is hon-

estly and entirely yours, than a larger one with some secret misgivings that it does not entirely belong to you.

So when John paid the ten cents to Ebenezer, he asked, —

“Where shall I measure the tree, Ebenezer, — down close to the ground, or where I cut it?”

“Where you cut it,” said Ebenezer. “You are to have a *pole* eight inches in diameter, and that too after it is peeled. So no matter if the ends of the string do not meet within an inch or two, when you put it round the tree. It won’t be too large.”

John now felt fully authorized to get as big a pole as he desired ; and when Thomas was ready, they all went off into the woods together.

They easily found the place which Edward had recommended to them. It was a slope of land descending toward a brook, and it was thickly covered with tall and slender trees, with very few branches below, and only a small spreading top of foliage above.

John and Thomas immediately began to

look about among these trees to find the most suitable one for their purpose. They chose one at last that was very straight and slender, and though they met with various difficulties and delays in cutting it down and hauling it home, they finally succeeded in accomplishing the work.

They left the pole on the snow as near as possible to the place where it was to be raised.

“There!” said John, “we will let it lie there till the snow is melted, and the ground is thawed, and I get the martin-house to put upon the top of it next spring.”

CHAPTER XVIII.

AN EXCURSION.

ONE morning, late in February, John and Benny went out before breakfast to see if the "crust would bear," as they expressed it, meaning, if the snow was hard enough for them to walk upon the top of it, without sinking in. They found that it was.

They determined at once to go in and get their sleds, in order to have a slide. But just then they heard the bell ring for breakfast.

"Never mind, Benny," said John; "we will go in to breakfast now, and after breakfast we will take our sleds and go off on an excursion."

Accordingly, after breakfast they brought out their sleds, and were just getting ready to set out on their excursion, when suddenly their cousin Mary appeared. She had come over from her own house, across the fields, upon the snow.

When she found that the boys were preparing to set out on an excursion, she proposed to go too.

"Yes," said John, eagerly; "and Benny and I will haul you on our biggest sled."

"No," said Mary; "I don't like to ride on a sled. It tires me to hold my feet out so straight. If you only had a little sleigh now, to draw me in, with a seat in it for me to sit on, so that I could put my feet down, — I should like that."

"When I learn how to use tools a little more," said John, "and have a shop, I mean to see if I can't make a little sleigh."

"Or if you could fasten a chair on your sled somehow, for me to sit on," suggested Mary.

This suggestion seemed to strike John very favorably. He said that he verily believed he could do it. So he went into the house and brought out a small arm-chair — one that belonged to Benny. It was of just about the right size for Mary to sit in.

John found some difficulty in placing the chair upon the sled — which was what is called a *frame-sled*, and had only bars

across the top — in such a manner as to give the legs a firm support. At length, however, by allowing the legs to pass down between the bars until the *rounds*, as they are called, “came to a bearing” upon them, he succeeded in giving the chair a stable support. He then proceeded to bind each of the legs to the bar nearest it, by means of some very stout twine, and so making the seat very secure. Mary, when she sat down upon it to try it, said she liked it very much.

So they set off at once on their excursion. Mary remained sitting in the chair, while Benny took hold of the tongue of the sled, to pull before, and John pushed behind, by the back of the chair.

They went on in this way very pleasantly and prosperously for about an hour, meeting with a great many amusing adventures, and seeing a great many curious things, until at length they came to a place where there was a brook. The brook was almost entirely covered and concealed by the snow; but here and there, in places where the water was wide and deep, pools were formed which were covered with ice,

smooth and dark in the centre, but bordered all around by a sloping shore of snow.

Benny, when he came near this brook, did not stop, but ran down directly upon the ice. He was the more encouraged to do this by finding that John did not hold back the sled, or call upon him not to go down.

Mary was, however, frightened a little, and gave a slight scream.

Then, as soon as Benny stopped, she said,—

“Now, Benny, that was dangerous. How did you know whether the ice would bear?”

“It looked strong enough,” said Benny.

“But you never can tell by the looks,” replied Mary. “You never ought to go upon any ice, till you have tried it.”

John, however, began jumping upon the ice, to show that it was very strong, and so Mary's fears were soon allayed. In a few minutes John gave the command to go on, and Benny began to move forward up the slope of snow upon the farther side of the ice.

Now it happened that this side of the brook was the western side, and the sun being in the east, as it always is in the morning, shone directly upon it, and had softened the snow somewhat, so that Benny in ascending the slope began to sink a little into it.

“ Ah me ! ” exclaimed Benny ; “ I am sinking ! ”

“ Never mind,” replied John ; “ the snow is not very deep. You won’t sink far. Besides, you will come down to the ice pretty soon.”

John was greatly mistaken in this idea, for as it happened there was no ice at all there underneath the snow. Benny, however, did not sink far, for he was not heavy enough ; but when John, in following along and pushing behind, came to the place, one of his feet went down entirely through the snow, and sank above the top of his boot in water and mud.

He saved the other foot from going in too, by sitting down at once upon the snow, and spreading himself out upon it, as it were, as much as possible, still holding on by the sled, however, to prevent its sliding

backwards. He soon drew his foot out of the hole, and then crawling along on his knees up the slope, he pushed the sled before him as well as he could, while Benny pulled hard, and in this manner they soon got up to solid and level snow again.

John now looked at his foot, which was dripping with ice-cold water. Then he went back carefully and looked down into the hole where his foot had gone through.

"What a deep hole!" said he. "And nothing but water at the bottom of it! I wonder what has become of all the ice!"

"Now, John!" exclaimed Mary, "your foot is all wet. I told you it was dangerous to go on that ice."

"No matter," said John.

Still, though he said No matter, he looked at his foot with a somewhat disconsolate air.

CHAPTER XIX.

ROSE'S.

It is a great mistake to suppose that there is any warmth in a blanket,—or rather that there is any warmth-giving power in a blanket. A blanket keeps the heat from passing, that is all. If you wrap up a cold stone in a blanket, out-of-doors, in a cold night, it would not make the stone any warmer.

If the stone was already warm, it would keep it from growing cold very fast, because it would keep the warmth of it from passing out.

But then, just in the same way, if you wrap up a piece of ice in a blanket, in a warm room, it will tend to keep the ice from melting, for it will keep the heat from passing *in*.

Blankets keep us warm in bed only by keeping the natural warmth of our bodies from passing away. Even if we are cold

when we put the blanket on, and become warm afterward, the warmth is never *produced* by the blanket, but only *kept* by it. It is always produced by the life of our bodies.

It is much the same with the snow, which is the natural blanket of the earth. Although it feels cold when we touch it, it does not allow heat or cold to pass through it very easily, and so wherever it lies it keeps the natural warmth of the earth in. This is the reason why around the margins of ponds, and along the shores of rivers, where the snow covers the edge of the ice, the ice is usually very thin, and sometimes gets melted away entirely by the natural warmth of the water. For water, as it comes up out of the ground in the springs which form the brooks, though it feels very cool to our hands, has still warmth enough in it to melt ice and snow.

When Mary found how wet John's foot was, she asked him what he was going to do.

"It is not far from here to where Rose lives," said John. "Let us go there. She will let me dry my foot by her fire."

"Well," said Mary, speaking in a tone of satisfaction.

"Yes," added Benny, clapping his hands. "Let us go to Rose's. I like to go to Rose's."

Now Rose was a very nice and tidy colored woman, who lived in a small house in a retired but very pretty place not far from a mill. She was very fond of children, and always treated them with great kindness and attention when they came to see her house. For this reason the children always liked to go and see her very much.

When John and his party reached the house, they saw Rose standing at the door, where the sun was shining in very pleasantly. She heard them coming, and had come to the door to see. John called to her.

"Rose!" said he, "we have got into difficulty."

"Ah!" said Rose, "have you? Then this is exactly the right house for you to come to. What is the matter?"

John explained the accident that had happened, and showed his wet foot.

"Ah yes!" said Rose; "you got caught in a trap. Snow along the edge of a brook or a pond or a river is Jack Frost's trap. He sets plenty of these traps along all the watercourses, and catches a great many boys in them. But, never mind. We'll soon make it all right. Come in."

So, leaving the sled at the door, the boys followed Rose, who led the way into a small but very pleasant room where she had been ironing. There was a nice bright fire upon the hearth, and several flat-irons before it. The sun shone in very pleasantly at the windows, near one of which Rose's ironing-table stood.

Rose brought seats for the children, and then proceeded to take off John's boot and stocking; after which she wiped and rubbed his foot with a hot towel, and then wrung out his stocking and hung it up before the fire to dry.

"Now," said she, "while your stocking is getting dry, you shall all have a little luncheon."

So Rose proceeded at once to set a small table at one side of the fire, and to put a cloth upon it, at the same time putting

down three small apple-pies before the fire, to warm.

Rose always made it a point on every baking-day to make and put into the oven several small pies or turnovers, on purpose for the children who used often to come and see her. It is true that this, and other such things that she did, made her a good deal of trouble, but she did not mind that, for the kindness that she showed the children made them all love her, and she liked to have the children love her.

As soon as the pies were warmed, Rose put them upon the table, and also placed in the middle of the table a pitcher filled with very nice, rich milk, and also three small mugs. When everything was ready, she placed chairs around the table and brought the children to their luncheon.

While they were eating their pies and drinking their milk, Rose talked to them and told them stories, while still she was herself busy all the time drying John's stocking by ironing it, first on one side and then on the other, with a hot flat-iron.

The children stayed more than half an hour at Rose's, and then, John finding that

his boot and stocking were entirely dry, put them on again, and the whole party bade Rose good-bye and set out on their return home. Rose advised them not to attempt to go across the fields, for the sun had been shining now so long that the snow must have become much softened in many places, and they might find it difficult to walk upon it. So they concluded to return by the road.

"Mary," said John, just after they had left the house, "I wish there was something that we could do for Rose, to pay her for all that she does for us."

"I wish so too," said Mary.

"But there is not anything we *can* do," said John.

"No," said Mary, "there is not anything at all."

In due time the party arrived safely at home, and John, unfastening the chair, carried it into the house, and put the sled away where it belonged.

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